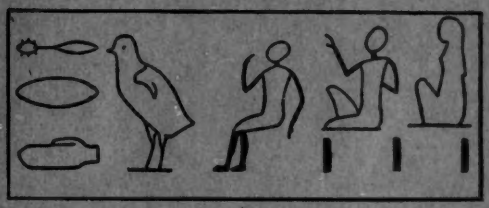
THIS NUMBER COMPLETES VOLUME 9

Vol. 9 DECEMBER, 1938 No. 4

CHILD DEVELOPMENT



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NATIONAL RESEARCH COUNCIL
2101 CONSTITUTION AVENUE
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ERRATA

Attention is called to two errors in wording in the paper entitled "Aspects of language development: The growth of loquacity and vocabulary," by A. T. Jersild and Ruth Ritzman, which appeared in CHILD DEVELOPMENT, Vol. 9, No. 3, September 1938:

Page 258 - 16th line from the top should read: "active vocabulary of children during their free play is relatively less adequate...."

Page 258 - 5th line from the bottom should read: "school environment is relatively more stimulating, in the motor sphere, to younger..."

COMMON CONTENT IN THE SPEECH OF PRESCHOOL CHILDREN

MARY SHIRLEY[1]

The student of child behavior recognizes that there is considerable community of ideas, as expressed in speech, among children in nursery school groups. Children tend to talk about the same things and in much the same terms, but whether or not these common verbal responses are attributable to the cultural contagion of a common environment is hard to determine in a nursery school setting. Similarity in the verbal responses of children who have not enjoyed association with their peers except through informal neighborhood play may throw some sidelights upon the extent to which the cultural background of young children is standardized even in the absence of schooling of any sort.

The object of this paper, therefore, is to examine some of the responses commonly made by children between the ages of two and five, as to the frequency with which certain concepts are mentioned, the sex and age differences that obtain in the expression of them, and the function they may serve in the child's adjustment to his world. It is to be hoped that analysis will reveal which responses are common by virtue of their being expressions of common needs and wants of the child, and which are merely a product of early culturization; in other words, which are outgrowths from within the child's own body, and which are superimposed from without.

The records used in this analysis are diary-type accounts of the child's all-day visit to a health center in the course of which he is subjected to a number of examinations with periods of rest, play and a meal interspaced. The record contains a verbatim account of the child's speech during a thirty to forty-five minute play period, together with briefer notes on the child's behavior upon arrival at the Center, at examinations, at meal and at rest. These records are obtained at six months' intervals on each child on the occasion of his regular visits to the Center for Research in Child Health and Development.[2] Visits occur within a week of the half-yearly birth date; hence, there is no ambiguity in the age grouping of children.

For the present study 336 such records of the child's day are used, 168 of each sex, distributed by ages as follows: 20 records at two years, 40 at two and one-half, 50 at three, three and one-half and four years, 60 at four and one-half and 66 at five years. No age level is entirely discrete as to personnel, however, as there are from one to four records on each child. Hence, the records of a given child may be tabulated at four successive age levels. Because of this overlapping of cases, age differences will not be emphasized in the discussion.

The technique employed in this analysis is simply that of listing the concepts or words that are most commonly found in the records, then of abstracting on cards the context in which that concept or word was used. A card is made for each of the common concepts found in the record of a given child.

Even though the child may have used a given word many times, it is counted only once per record, except in cases where a second usage differs markedly in context from the first. A number of words, particularly those referring to mother and home, were used both in straight-forward exposition and with emotional connotations. Such words are recorded twice per record, once for the emotional and once for the non-emotional context. For example,

[1]From Center for Research in Child Health and Development, Department of Child Hygiene, Harvard School of Public Health.

[2]For a more complete account of the activities of this Center, and the specific conditions under which the observations were made, see Publication No. 1 of the Department of Child Hygiene, Harvard School of Public Health (2).

a child may say, "I had one like this, but it's broke. My mother is going to buy me a new one." This bit of conversation furnishes four common responses: one for recognizing a familiar object (one like this) and one each for reference to "break", "buy" and "mother". If the same child later says, "I want my mother to come take me home," the word "mother" is again recorded, because the child's usage indicates that his utterance is an expression of insecurity in the absence of the mother, rather than a matter-of-fact informative reference to her. If in the same record, the child inquires, "Who broke this?", the query is added to the original card for "break", but this response is not counted a second time for that record, since the second usage differs little from the first. This prevents a common response from obtaining a high frequency of usage merely by virtue of its being reiterated time and again by the same child. For the measure of commonness of a response is the number of children who use them, not the extent to which it is used by a single child.

Number of Common Word-Concepts and Expressions: In all, 50 different word-concepts occur frequently enough to warrant tabulation, and the records yield 1,502 tabulations under these headings. Almost a third of these are attributable to four word-concepts: mother, father, sibling and home. It is at once apparent that these family word-concepts belong in a class by themselves, not only because of their highly common usage, but because of their great emotional significance to the child.

Sex differences in usage of concepts are obscured by the fact that the girls are far more talkative than the boys in this situation. Exclusive of references to family concepts, the girls used 1.4 times as many common concepts as the boys (total concepts: girls, 633; boys, 457). Greater common content in the speech of the girls seems to occur not because their speech has less variety than that of the boys, although this is a possibility, but because they make more utterances in the same unit of time. As a method of equating the sexes in loquacity, the raw frequency of word-concepts for the boys is multiplied by the factor 1.4. In the use of family concepts, the discrepancy between the sexes is not so great (total concepts: girls, 222; boys, 190). There is no reason to believe that the boys are not equally laconic in all their speech; on the contrary, there are good grounds for supposing that the boys' greater freedom in the use of family concepts is an expression of their greater insecurity and emotional need. Hence, the 1.4 correction is applied to these concepts also. The degree of correction is far more conservative than it would have been if based on the number of words or sentences uttered, for the girls utter many more words per sentence, and more sentences per play interval than is indicated by the 1.4 correction.

Frequency and Sex Differences in Frequency of Concepts: The 50 common word-concepts classified under functional headings are listed in order of frequency of usage in Table 1. The first column gives the total uncorrected frequency, the second, the frequency for girls, and the third gives the corrected frequencies for boys. Raw frequencies for the boys may be computed by subtracting girls' frequencies (column 2) from totals (column 1). The last column represents the ratios of the corrected boys' frequencies to those of the girls and thus furnishes a rough indication of the significant sex differences.

The table is worth scrutiny both for the order of frequency of the responses and for the sex differences it reveals. The word "mother" tops the list with more than twice as many usages as any other word. The interesting fact here is not that "mother" is mentioned by the majority of the children, but that in 51 records for girls and 38 records for boys, the mother was not mentioned during the day; more girls than boys evince this type of independence of the mother.

TABLE 1

WORD-CONCEPTS COMMONLY USED BY CHILDREN TWO TO FIVE YEARS OF AGE

Word-concept	(Based on 334 records)			
	Total Usages (uncorrected)	Girls	Boys (corrected)	CB/G
1. Mother	208	117	130	1.11
2. Negations	89	26	90	3.46
3. Sibling	83	52	44	.78
4. Make-believe	77	35	60	1.71
5. Proper names	64	39	36	.92
6. Attention-calling	63	39	37	.94
7. Home	62	25	53	2.12
8. Question - What's this?	62	27	50	1.85
9. Size - big	60	35	36	1.03
10. Father	59	28	44	1.26
11. Cry	56	27	41	1.52
12. Size - little	43	23	29	1.26
13. Cleanliness	41	30	17	.56
14. Clothes	40	30	14	.47
15. Excuses	38	22	13	.59
16. Break	34	17	24	1.41
17. Buy	32	17	21	1.13
18. Numbers	32	18	20	1.11
19. Other child present	31	18	18	1.00
20. Possessives	29	22	10	.45
21. Help, give	27	20	10	.50
22. Help, seek it	26	20	9	.45
23. Permission	26	15	15	1.00
24. Illness	22	20	3	.15
25. Information	21	7	20	2.86
26. Familiar objects	19	11	11	1.00
27. Undress	16	9	10	.90
28. Direct others	14	8	9	1.12
29. Memory	14	10	6	.6
30. Seek security	12	7	7	1.00
31. Express enjoyment	11	7	6	.86
32. Beg	11	5	9	1.8
33. Mother of another child	10	7	4	.58
34. Tattle	8	7	1	.14
35. Beauty	8	6	3	.50
36. Fear	8	7	1	.14
37. Fixation	7	4	4	1.00
38. Ownership	7	2	7	3.5
39. Sex differences	7	5	3	.6
40. O'clock	6	3	4	1.3
41. Seasons	5	4	1	.25
42. Weather	5	3	3	1.00
43. Personalities	5	3	3	1.00
44. Objections	5	5	0	----
45. Money	4	0	5	----
46. Self-praise	4	3	1	.33
47. Grow up	3	0	4	----
48. Independence	3	1	3	3.00
49. Week-days	3	1	3	3.00
50. Threat	2	0	2	----

Refusals and negative responses stand second in the list by virtue of their frequent usage by boys; they occupy rank 12 for the girls. Boys give vent to negative expressions thrice as frequently as girls.

Sibling, home and father are among the ten most frequently mentioned concepts; siblings[3] are referred to more often by girls, but home and father are mentioned oftener by boys.

The high frequency of make-believe or fantasy concepts is to be expected at preschool ages, but it is a little surprising to find boys verbalizing their dramatic play more readily than girls.

The concept that every person has a name arises early in childhood, but the child's application of names to adults and children whom he knows only in the clinic situation depends both upon his intellectual grasp and his social poise. The child who is ill at ease seldom calls the adults or other children by name. Sex differences in the use of proper names are negligible. The category of proper names is fifth in the list of common responses.

The words "lookit," "see," and "Watch what I do," all classified as attention-calling, also have a place among the ten most frequent responses. Boys and girls differ little in the extent to which they call the observer's attention. The naming question, "What's that?", which occurs with practically the same frequency as the attention-calling response, is considerably more frequent for boys. This question is often rhetorical and is asked for the sake of getting attention, since the child often answers it himself in the same breath.

The word "cry" occupies rank 11 and is somewhat more frequently used by boys than by girls.

References to sizes, big and little, occupy the 9th and 12th positions respectively; "big" is used more frequently by both girls and boys, and the child most often applies it to himself, as "I am a big boy," and to his possessions and activities, as "I have a big truck at home"; "I'm going to eat my big orange"; and "See the big train I made. A big, big one." These children seldom apply the term "little" to themselves or to anything they have or do; instead they use it to refer to other children, regardless of their age or size, as "My yitta bubba" (little brother), used by a two-year-old to designate her four and one-half year sibling, and "I can hear somebody cryin'. She must be little." They also use "little" in referring to neutral objects, as "There used to be a little gas pump here."

In short, the eleven most frequently used word-concepts all seem to carry an emotional charge for the children. There is a rather marked gap in frequency of usage between the words "cry" and "little". With the latter begins a list of words fairly neutral in emotional connotation that extends, with some exceptions, through the remainder of the list.

The two concepts that occupy positions 13 and 14, cleanliness and clothes, are of interest because they are mentioned about twice as often by girls as by boys. Girls make excuses, invent alibis and make rationalizations about their behavior more often than boys (item 15). They are more often possessive, saying, "This is mine" about the playroom toys that are to be used by all children (item 20). Girls also exceed boys both in offering to help others (item 21) and in appealing for help from others (item 22). Perhaps the most interesting sex difference of all is that in mentioning illness (item 24). References to their own illnesses or to the ills of their family or friends were found in only three records for boys but in twenty for girls. In fact, several

[3]The records of 73 children of each sex entered into this analysis. The number of children having one or more siblings was approximately the same for each sex. Nineteen boys and eighteen girls lacked siblings, and hence had no opportunity for mentioning brothers and sisters.

little girls dwelt at length upon the ailments of grandparents, neighbor children, and gave every indication of being considerably worried about the sickness of others. Other types of speech used more often by girls than by boys are tattling (item 34), aesthetic concepts (item 35), expressions of fears, real or imagined, (item 36) and the concept of sex differences (item 39). Under the last heading are classified such expressions as "Hey, these airplanes are only for boys, ain't they?" Such expressions suggest that girls become conscious of the accepted sex mores at an earlier age than do boys. This list suggests that the typical feminine conversational interests begin to appear in the speech of girls even at the preschool ages. Clothes, dirt, ailments, solicitude, appearance, gossip, temerity and the opposite sex have been recognized as forming the bulk of women's small talk from ages untold.

Boys' conversational interests are less clearly defined. They show a lead over girls in most of the first eleven emotionally-charged responses, and a definite lead in offering gratuitous information. They say "This is broke" or ask "Who broke this?" a little more often than girls. They also lead very slightly in the concept "buy"; the four references to "money" were all made by boys; they made more inquiries about the ownership of various toys in the play room, and more of them begged for a toy to take home. Hence, there is a slight indication that economic concepts begin to play a part in boys' conversation earlier than in girls.

Further analysis and speculation must be deferred until the contexts of the usages are described more fully.

Emotional References to Family: The high frequency of references to mother, father, sibling and home occur partly because the children use these concepts in expressing their insecurity. The number of insecurity responses to each of these words is given in Table 2.

Children use the words "mother" and "home" more often to express their insecurity than to give information, whereas they more often speak of the sibling and the father with matter-of-factness. For each of these four words, boys have a higher number of responses indicating insecurity than girls. Girls exceed boys in number of informative references to the mother and sibling; boys exceed girls in number of informative references to the father and to the home. These sex differences would be of only passing significance were they not in such perfect accord with other evidences of the boys' excessive insecurity in the absence of the mother.[4]

Developmental trends in these responses can be presented far better by illustrations than by classification and generalization. With the two words most highly charged emotionally, home and mother, insecurity references predominated up to the age of four years; thereafter, informative responses became more common. Some typical examples of the insecurity references, age by age, are given in Table 2.

The terms in which insecurity references are couched shows marked development during the three-year span from two to five years. The two-year-old of either sex characteristically expresses insecurity by the single word "Mamma," or by calling the sibling's pet name in case he is present. Home and father are not even mentioned at these ages.

At two and one-half the insecurity response is elaborated by the word "want" as "Want Mamma" or "Wanta go home," and sometimes by the question "Where is?" or "Where went?" The child's feeling of insecurity is entirely of the immediate present, and at this stage assurance that he will, in the near future, return to the haven of home and mother is of no avail. By three

[4]Evidence confirming this statement is to be published by the author in a forthcoming monograph of the Society for Research in Child Development.

TABLE 2

INSECURITY REFERENCES TO MOTHER

Age	Girls	Boys
2 yrs.	Cried, "Mamma, Mamma."	Called, "Mamie," showing no interest in play.
2½ "	"Where my Mamma go? Want to see Mamma."	"Want my Muddah."
3 "	"My Mother coming over and get me after my nap?"	"Mamma coming back pretty soon?"
3½ "	"I wish my Mummie would come take me home."	"My Mamma be up after me in two more minutes; I want to stay right here where my Mamma can find me."
4 "	"Teacher, teacher, is that my Mother downstairs?"	"I want to look out the window and see if my Mamma's coming."
5 "	"When is my Mother coming?" "Wish she would hurry up and come."	"I wish my Mother would hurry up and come."
	"My Mother's going to say, 'Where's my child?' and Carol's going to say, 'Where's my sister?'"	"I don't want to rest. If Mother comes, she won't know where to find me. She'll ask the lady who washes dishes, 'Have you seen a big boy?' and that'll be me; and she'll say, 'Yes, he's upstairs,' and she (mother) will come get me."

INSECURITY REFERENCES TO HOME

2 yrs.	None.	None.
2½ "	"I want to go home."	"I want to go home for my dinner."
3 "	"I want to go home, 'cause my Mummie's crying'."	"I want my Mammee come home now." (to come home to my Mamma)
4 "	"When you going to take me home?"	"I want to go home. My Mother wants me."
5 "	"I want to go home when it's night."	"I want to go home to eat."

INSECURITY REFERENCES TO SIBLING*

2 yrs.	Called, "Bubba; Bubba." (brother)	Called, "Minkie, Minkie," his nickname for sister.
3 "	"Where sista go?"	"Woofie (sister) come up 'tairs?"
3½ "	"Mary will come, won't she?"	"My brother, he here too."
4 "	"Hey, Tom, come on over here."	
4½ "	"Oh, I've found Leo" (brother).	"Where went Julladeen?"
5 "		"What if Dougie came up here and we weren't here?" (child had been asked to go downstairs)

INSECURITY REFERENCES TO FATHER

Insecurity references to the father did not occur in either sex at two or at five years. At all ages between, the references were simply:

"I want Daddy."
"My Daddy is coming for me."
"When will my Daddy come?"

*Such references occurred only when two siblings were present at the Center together; hence twins and siblings whose semi-annual birthdays fall within a week are the only children who have an opportunity for this type of response.

years, however, the child's concept of futurity has developed sufficiently to enter into his feeling of insecurity, and he inquires, "My Mother coming?" The time element plays an increasing part in the child's speculations about his mother's coming, and he employs the words "when" and "what time," "soon," and "hurry" to express his impatience for her arrival. Watchful waiting for the arrival of the mother occurs at earlier ages than four years; for children of two and one-half sometimes stand disconsolately gazing out the window. Not until four years, however, do they verbalize their motives by saying, "I want to watch for my mother."

Fear lest the mother or sibling might come and not find the child was expressed by a boy at three and one-half and by three others at five years; no doubt the same fear, though unverbalized, prompted other children's objections to leaving the playroom or their preference for sitting in the waiting room, rather than going outdoors to play with other children. At five years there are interesting examples of predramatization of the mother's coming by one child of each sex. In each case the child anticipated in imagination far more tender concern on the mother's part than she evinced when she came. Such imagined greetings suggest that these two children may feel somewhat rejected by their mothers, or at any rate, that they desire more expressions of affection from the mother than they are getting. In contrast with these two rather pathetic instances, there is one example of an over-dramatic mother-daughter greeting at the same age. The child rushed into her mother's arms with ecstatic cries, "Hello, Mother dear!" and the mother clasped the little girl saying, "Hel-lo, dar-ling!" in the appropriate Hollywood inflection. If the scene had been rehearsed in advance, it could not have been more patently "staged." Were corroborative evidence lacking (it is not), this incident alone would have sufficed to show that both mother and child were living in a cinema dream-world with Shirley Temple as their model and inspiration.

Though the verbal expression of insecurity changes with age and increases in complexity as the child's command of the language and his grasp of concepts of time and space improve, there is little evidence that his feelings of insecurity are any less real and acute at the later ages. To be sure, some children develop a sense of self-reliance and apparently lose all feeling of insecurity before the age of five years. For those children whose feeling of insecurity persists, it seems to exist at the same degree of severity, or even to increase, because they become increasingly aware of their own helplessness and better able to imagine dire outcomes of their temporary separations.

Non-emotional References to Family: The children refer to the parents in a variety of other ways, the most frequent of which are given in Table 3.

TABLE 3

NON-EMOTIONAL REFERENCES TO THE PARENTS

Type of Reference	References to Mother			References to Father		
	Girls'	Boys' (corrected)	Total	Girls'	Boys' (corrected)	Total
Parent as a provider	9	6	13	4	3	7
Parent as disciplinarian	12	6	16	0	0	0
Parent as providing routine care	5	0	5	0	0	0
Parent as providing recreation	0	0	0	5	7	10
Matter of fact statements	11	9	17	6	6	10
Father's work	0	0	0	4	9	10
Parent as an alibi	4	7	9	1	0	1

The parent is mentioned in the role of a provider a total of 20 times. Most of these statements are of the type "My Mother (Father) is going to buy (bought) (brougnt) me a train (ice cream, puppy)" or "Mother made my dress (coat)"; "Father made me a table and chairs (whimmin' pool)." There are 26 matter-of-fact statements about the parents; those referring to the mother concern her whereabouts or what she is doing at the moment: "My Mother is at home (at Gramma's)"; "My Mother always boils eggs." At later ages they are more informative, as "My Mother lived in Maine when she was a little girl." Those to the father are of the same type, with the addition of references to things he does and does not like to eat. Mother's food fads, if she has any, go unmentioned.

Mother alone is referred to as a disciplinarian, and twice as many girls as boys mention her in this capacity. The disciplinary reference usually is to an admonition, real or imagined, not to get dirty, the most extreme one being "My Mother'll kill me," (the child had found a spot on her coat). Four children referred to the discipline of a sibling or of another child: "My Mother spanks the daylights out of Bobby." Of the references made by boys, two were the mild statement: "My Mother never lets me pour at the table"; one was the statement, "Her Mamma's spankin'" upon overhearing another child cry; and the other was the statement that "Mother says the piano is just for Ann," implying that the child had been admonished to keep hands off his sister's possessions. One boy boasted at some misdeed, "My Mother won't touch me." The girls' more frequent references to the mother as a punisher offers fragmentary evidence, but it suggests either that mothers are firmer with girls or that the girls take the mothers' admonitions more seriously.

It is perhaps significant, too, that fathers are never mentioned in the role of providing routine care: "My Mother made my curls (feeds me, brushes my teeth)"; and mothers are never mentioned in the role of providing special excursions or recreation: "My father reads me stories (took me to the park, takes me fishin', fwimmin', coasting, fished me out of a pond when I fell in a long time ago)." Mother, it would seem, provides the necessities; father provides the luxuries and pleasures, from the child's point of view. This fits the division of labor of child care as it is worked out in most American families.

A further bit of evidence that corroborates the statement that boys are more interested in economic matters than girls is their more frequent references to the father's work. Most of these are simple statements: "My Daddy has gone to work" or "My Father is working now," in contrast to being unemployed, or "My Grandmother (the father-surrogate in a family where Mother and Father had been separated) works as a waitress." Two boys referred to the father's lack of ability to provide cars for the family in these ways: "My Father hasn't a car, so he borrows everybody's car"; "My Daddy works, too, out in the street. His car's in the g'rage. He's not any money to take it out." Work, money, buy and borrow are early forming concepts in these preschool children; and it seems probable that the more precarious the family's economic condition, the more readily the children learn these simple economic principles.

Making a scapegoat of the parent in an effort to get out of doing a distasteful act is one of the clever types of usage of the word "mother." The child says, "My Mother doesn't want me to sleep (eat, drink) here." "My Mother lets me spit out my tomatoes." "You were my boss, but now my Mother's here, and you're not my boss any more." Only one child mentioned the father in this way, saying, "My Father doesn't want me to get undressed -- to get measured." A few children use the mother as a threat to other children: "My Mother says don't do that!" "I'll tell my Mother on

you." Thus, the child uses the absent mother as a barrier between him and an adult or child who, he feels, threatens his security or pleasure. There are a few references to helping mother: "I help my Mother, but I won't help you"; "I sweep the floor for my Mother and do everything for her." A four-year-old boy gave an amusing example of desire to share with the mother. He came to the play-yard with four pieces of candy saying, "One for me and one for Priscilla; and one for my Mother and one for Priscilla's mother." He gave a piece to Priscilla, ate one, reserving two; presently a second piece found its way to his mouth, and he rationalized his cupidity, "One left for my Mother; Priscilla's mother won't know I had any candy."

Other ways of referring to the parents are to their possessions: "My Mother had a p'ato masher like this"; "My Daddy has a truck." Some refer to the mother as an authority in point of fact; "My Mother says it's ten o'clock." "My Mother thought it might snow." Others refer to the mother as an exemplar, as "I wipe my hands like Mamma," and "My Mamma doesn't make a cake (cook fish) like that," the implication being that Mamma's way is better. A few announce their intentions of telling Mother about their day, as "I'll tell Mother I didn't crv when I was weighed," or of deceiving her, "I'll tell Mother I did cry," when he hadn't.

These parent references on the whole are free from emotional undercurrent, and the usages fit in with the commonly accepted appropriate roles for mothers and fathers to play in the children's lives, Mother as provider of comforts and discipline, Father as breadwinner and provider of simple pleasures.

The children refer to their siblings in only about four different ways (See Table 4). Their most common type of reference is a matter-of-fact informative statement: "Betty's at school"; "You know I got a little baby home and he can stand alone"; "Sister wanted to come with me"; "Junior's birthday's in June."

TABLE 4

REFERENCES TO THE SIBLING

Type of Reference	Girls'	Boys' (corrected)	Total
Matter-of-fact information	19	14	28
Protective or affectionate references	3	7	8
Siblings' misdemeanors	7	1	8
Siblings' possessions	5	1	6

References to the sibling in an affectionate or protective way were made more frequently by boys than by girls. They included such items as: Don't get my sister dirty, or I'll knock your head off"; "Who's crying -- not my brother?" "Want to go see Mamma, Honey?" was a remark made by a four and one-half year-old girl whenever her little brother's tears subsided, and he became engaged in play. The attendant was unable to decide whether the girl was trying to be solicitous or was being wantonly cruel. References to the siblings' possessions and to the siblings' misdemeanors were made more often by girls. They included such items as, "My Mary sucks her thumb";

"Tom puts grease on himself"; "My sister has a piano, but she never plays it"; "Tricia's a fresh thing."

The sex differences are really too slight to be of much significance, but they suggest that sibling rivalry plays a slightly greater role in girls' lives than in boys'.

The word "home" was used in only two ways by the children, in addition to its emotional usage. Home is conceived by the child as the place where he keeps his possessions, as is indicated by such references as, "I have a good bike at home"; "I want to take this (paper napkin) home with me"; "I got better blocks than these at home." The second, and less frequent type of reference is to home as a place to which one returns, as "Every time I go home, I lay down"; "When I get through kindergarten, I'm going to stay home." Home is a retreat, and home is where one's treasurers are.

References to Crying: The word "cry" has two very different types of usages according to whether the child employs the word in reference to another child or to himself. Reference to the crying of another child is either a matter-of-fact comment, such as "Girl crying; girl mad!" or an equally matter-of-fact question, "Who is crying?" "Why is he crying?" When the child uses the word "cry" in reference to himself, it is usually to boast, "I didn't cry." Occasionally a child confesses, "I did cry," or threatens, "I will cry." Frequencies of these responses are given in Table 5.

TABLE 5

REFERENCES TO CRYING

	Girls'	Boys' (corrected)	Total	CB/G
Comment on cry of another	16	21	31	1.3
"I didn't cry."	9	18	22	2.0
"I did (will) cry."	2	2	4	1.0

Boys use the word "cry" one and one-half times as frequently as girls. They refer to the crying of another child one-third more often than girls, and they boast about not crying twice as often as girls. Indeed, boys' usage of the word indicates a growing intolerance of crying and an impatience with those who give way to their feelings in tears. They say:

2 yrs. "Crying" with some sign of distress upon hearing outcry of another.
2-1/2 yrs. "Hear baby cry. Mama's 'panking."
3 yrs. "Who's that crying? My sister don't cry."
4-1/2 yrs. "I'm not going to stay here and listen to him cry. Isn't he a crybaby?"
5 yrs. "I could hear her screeching upstairs!"

In their boasting responses, boys say:

3 yrs. "I'm a big boy. I don' cry."
"I don't cry. Only Billy cries."
4-1/2 yrs. "It hurt, but I didn't cry."
"I don't cry when I go on a swing or when I fall down."
"I didn't cry and you did!"
5 yrs. "He's going to cry when you do that. I screamed before, but not this time.

The girls' usage of the word "cry" seems to be tinged with a little more sympathy for the child in distress. They ask the reason for the outcries or try to give a plausible excuse for the other's child's crying. Examples follow:

2 yrs.	"That baby is crying for me!"
2-1/2 yrs.	The cry of a crippled child who was being fitted with braces was overheard. The little girl asked, "Why is that boy crying?" She was much interested in the explanation that was given her, and later she told her mother, "A little boy was crying, because he had a sore foot."
4 yrs.	"He's crying because he wants to come out here."
5 yrs.	"She's crying 'cause she doesn't want her dinner." "I can hear somebody crying. Not that big girl. She must be little."

The boasting responses of girls, "I didn't cry" are much more similar to those of boys, but are made much less frequently. These differences in the usage of the word "cry" suggest that the cultural pattern of "grin and bear it" is imposed earlier and more thoroughly on boys than on girls. Boys' greater frequency of boasts about not crying is interesting in light of the fact that boys cry more frequently than girls at being separated from the mother and at arriving in the playroom; but they cry less frequently than girls at the blood test.

The "I don't cry" response as given by these children begins at three years, thus coinciding with the age at which Murphy (1) obtained it in her study of sympathetic responses of nursery school children. Murphy found the response spreading in the nursery school group, apparently from cultural contagion; the response was started by a little girl of considerable daring and prestige and was taken up by other members of the nursery school. Results from this group indicate that although the response is far from universal, it does occur as a common response among children who have not been subjected to a common environment. In so far as the response is culturally determined, therefore, it acquires its commonness among these children because of the parents' common standards of child behavior.

Make-believe Play: Dramatic conceptions fall into two types, a very simple type, comprising mostly imaginative references to food, such as, "I'm making a cake". "I'm making a cup of tea"; "Do you want a cup of coffee?" Most of these simple imaginative utterances occur during sand play and are stimulated by the tea set, spoons and other cooking utensils for use in the sand. Simple imaginative references to garages, trains and block structures are also included in this group. These simple dramatic references are more frequently made by the boys. The more complex dramatizations are oftener made by girls, probably because they are usually associated with doll play. They include such items as, "My baby must wear a hat, so she won't catch cold." "Toys for sale, toys for sale; twenty-nine cents!" "I'm going to be the man who sends his tax." "What could be the table?" (A table that was in full view was pointed out). The child rejected this suggestion and chose instead a ladder-step as her table, saying, "Well that (table) could be the table, but this (ladder) will be it." The joy of make-believe is in the pretense, not in the similitude to reality.

Names: Correct usage of proper names is one index to the expansion of the child's social world. Only a few children under four and one-half years use the name of another child in addressing him. A few children learn and use the names of staff members by the age of four years. At three and one-half and four years, a number of them also speak of their absent acquaintances by name saying for example, "Larry can't go to Sunday School, 'cause

he's naughty and bad." "Do you know Smithers out in Woxberry? He sells ice cream cones." "Do you know Sonny Shotlum?" Place names such as Roxbury, Dedham, Plymouth, Franklin Park, New York, also begin to play a part in the speech of children in the fifth year. Children of wider social experience, such as nursery school children enjoy, would unquestionably use proper nouns more freely than these children did. The nature of the child's references to absent persons suggests that at the early ages he expects his conversant to be acquainted with all the persons he knows. This childish attitude is not far different from that of the adult who says, "So you're from Chicago! You don't happen to know the John Smiths, do you?"

Excuses: Rationalizing, presenting alibis and manufacturing excuses usually is regarded as rather an adult device for escaping from something unpleasant. This study indicates that the child is clever enough to think up plausible reasons for doing or not doing an act as soon as he has sufficient command of language to talk in sentences. Five children of two and one-half years and twelve of three years invented excuses for themselves. One little girl of two and one-half said, "I'm going to take this dolly home." When she was told she could not have it, she appealed on behalf of her baby brother saying, "But Gerard would like this dolly." At three years a child who was being detained upstairs said, "I want to go downstairs, 'cause that baby is crying for me." The most frequent excuses for avoiding examinations were: "My Mamma don't want me to be undressed" or "measu'ed" or "pricked," and the familiar toilet dodge. Excuses for not eating the food that is offered are the "It is too hot" or "cold" of fairy-tale fame. By four years the children are even more clever at veiling their true motives. A boy who did not want to play replied to a suggestion, "That makes too much noise, It might worry the babies downstairs." A girl of four and one-half said to each play suggestion, "My Mother doesn't want me to go near the sand in my clean dress." "My Mother doesn't want me to ride a bike, because I might get hurt." A boy of the same age said, "I want this window up, 'cause I want fresh air" when he actually wanted to lean out to watch for his mother's arrival. A five-year-old boy who had made a scatterment of toys said, "I can't pick up anything, 'cause I got a cold." It is an alert adult who can outwit even the preschool child by convincing counter-arguments.

Common Responses as an Expression of the Child's Needs:[5] The word-concepts and expressions most commonly used by these children seem to be expressions of fundamental needs. The need for security as expressed in his desire for home and family, in his requests that a staff member stand *in loco parentis* and in his demands for help accounts for about 16.5 per cent of the total number of common responses. Negative responses (No, I won't; I don't want to), excuses, desire not to be undressed, and declarations of independence (I can do it myself) are expressions of the child's need for autonomy and independence and of his need for harm-avoidance. These four categories comprise 9.7 per cent of the total number of common responses. In calling the adult's attention to his activities, and in many of his questions, the child is expressing his need for recognition, and in some cases, his need for exhibition. His need for affiliation finds expression in his use of proper names and in his reference to his companions of the day. These last two needs each account for approximately 6.3 per cent of all the common responses.

The child's need for nurturance is expressed in his references to helping mother and other children, and in some of his sympathetic references to the crying of another child. This need was expressed in about 4 per cent of the common responses. The need for blame-avoidance and for a super-ego is seen

[5]The needs employed in this analysis are taken from the list compiled by Dr. H. A. Murray, Jr. and obtained from him in manuscript form.

in a number of the responses of seeking permission, and in some of the usages of the word "cry" (I didn't cry.). These also amount to about 4 per cent of the total common responses. Reference to size, particularly to bigness is perhaps an expression of the child's need for achievement and mastery. It accounts for another 4 per cent of the common responses. About 20 per cent of the responses serve an informative function and perhaps may be considered as an expression of the child's need for exposition.

According to this sketchy analysis, at least 50 per cent of the common responses made by these children are an expression of his fundamental needs. More detailed analysis undoubtedly would increase this percentage, rather than diminish it. In the particular situation in which these observations were made, namely an all-day visit to a health center during which the child was separated from his mother and subjected to a number of examinations, the most important need is for security or succorance; and the second most important need is for autonomy and independence. Judging by relative frequency in common responses, children strive first for help; if it is not forthcoming, they then strive to stand on their own feet.

Common Responses as Imposed by Culture: The case for common cultural heritage as a basis for the development of common concepts is less clear-cut, largely because only one cultural background is represented by the children in the group. The influence of cultural impact may be seen in the large number of non-emotional references to the family. The point that the differences in types of reference to the father and the mother correspond to the commonly accepted concepts of their respective roles in child care has already been made.

Perhaps the marked sex differences in references to cleanliness and clothes may be laid at the door of a culture that imposes a "sugar and spice and all things nice" deportment upon little girls, but that brands the same standards of personal tidyness in boys as "sissy". The girls' greater morbid concern over illness, however, is less clearly imposed by culture, unless this be an outgrowth from the nurturant attitude that is fostered by doll play. It seems equally justifiable in the present state of our knowledge to attribute the sex differernces in these three common responses to a complex of needs that are stronger in girls than in boys; in other words, to a biological sex difference, rather than to a culturally conditioned one. The degree to which common cultural impact determines the common verbal responses of unacquainted preschool children could be determined only by obtaining responses on a group of children of different cultural backgrounds.

Summary: Analysis of the verbal responses of preschool children who are not subjected to the common environment of a nursery school reveals a large number of commonly used words and concepts. At least half of these, and probably more, seem to arise out of common needs of the children. Another 20 per cent of the responses are largely expositional. What proportion of the responses arise out of common cultural background is undetermined.

In the particular setting in which these responses were obtained, the word most frequently used was "Mother" and other words referring to home and family had high frequency. Sex differences were marked in negative expressions, wherein boys exceeded girls, and in references to clothes, cleanliness and illnesses, wherein girls surpassed boys. The need most commonly expressed was for succorance or security, and that second in importance was for autonomy or independence; the needs for affiliation and for recognition tie for third place, and those for nurturance, blame-avoidance and achievement tie for fourth. It is probable that this hierarchy of needs obtains only for preschool children when they are subjected to conditions similar to those of this study. Common needs of childhood offers a more clear-cut explanation of common responses than does common cultural impact.

A knowledge of the common verbal usages of preschool children is of

value not only for studying common elements in child nature and in its environment, but also for judging the degree of idiosyncrasy of an individual child's responses. A child that has a large number of common responses differs greatly from one who has few; and the child who employs common responses in a manner counter to that of the group, as for example, the boy who refers to himself as a "little boy" and to "the big, big world" when other children commonly apply the word "big" to the self is highly individualistic to say the least. The possibility that further analysis of common responses as they occur in free conversation might lead to frequency tables that could be used in diagnosis of personality distortions makes this method worthy of further exploration.

REFERENCES

(1) Murphy, Lois B.: Social behavior and child personality. New York, Columbia Univ. Press. 1937. Pp. 114, 230 - .

(2) Stuart, Harold C.: The center, the group under observation, sources of information, and studies in progress. Society for Research in Child Development. Monograph Series, (In press).

DEVELOPMENT OF IMMATURE BABIES DURING THEIR FIRST TWO YEARS

MARY SHIRLEY[1]

Observers of the psychological or "mental development" of prematurely born children have come to a variety of conclusions: that the effects of prematurity on mental growth last as long as five years, that the effects of prematurity disappear by five months, that weakling prematures are not worth the rearing, that prematures exhibit mentality of the highest type, that children of birth weights under 1500 grams do not develop normal intelligence, that the proportion of mental defectives is practically the same for prematures as for the general population. These statements represent extremes of the findings of various investigators. The truth probably lies on some middle ground. All observers are agreed, however, that the prematurely born baby is psychologically under-developed at birth, and that he is especially subject to trauma at birth that may leave permanent cerebral or other neurological defects. Does this decrement of prematurity persist throughout life, or does he overcome his birth handicap; and if so, how early is he able to overtake the normal baby of his own birth age?

The divergent answers that workers have rendered to these questions probably are traceable in part to the examiners' inability to obtain early and frequent observations on a sizable group of infants. Gesell's (4) pronouncements are based on frequent cumulative records obtained on relatively few children. Those of Bradner (2) are based on a large sampling, but the children are of school age at the time of testing. Mohr and Bartelme (8) likewise report on a sizable group, and utilize both the Gesell and the Kuhlman-Binet tests, but their age range at testing is from eight months to seven years. Melcher (7) tested her 42 cases prior to eighteen months, using the Bühler-Hetzer scale, but her cases range in age from one and a half to nineteen months at time of testing. The developmental quotients she reports seem to be decidedly high for babies of lower middle-class parents, for 8 of the 42 cases rate 120 and above, as against 2 cases of 80 and below. Her developmental quotients do show an upward trend with age, however, which is the phenomenon one would expect if the babies are developing at an accelerated rate that enables them eventually to catch up with term babies of their own birth age.

The data about to be presented represent one aspect of a study[2] of prematurely born children, (i.e. children of birth weights under five pounds) wherein the babies are brought to the Center at intervals of three months for psychological, pediatric, anthropometric, orthopedic, and roentgenological examinations. The observers have as a basis for comparison data obtained under similar conditions on approximately 250 babies[3] born at term.

Psychological examinations have been given to 63 babies of sub-normal birth weights, 27 boys and 36 girls. In all, 215 examinations have been given; 17 children have been given 5 tests each, and 16 have had 4 tests, spaced at three month intervals from six to eighteen months. Only eight cases have failed to return for at least one subsequent examination. Although the observations show a number of undesirable gaps, nevertheless they represent a more complete series during the early period than has yet been reported.

[1]From Center for Research in Child Health and Development, Department of Child Hygiene, Harvard School of Public Health.

[2]The study is under the direction of Lendon Snedeker, M.D.

[3]For a description of both the Premature Series and the Normal Child Series, see Publication No. 1 of the Department of Child Hygiene, Harvard School of Public Health. Reference (9).

TABLE 1

MENTAL GROWTH OF PREMATURE GIRLS--DEVELOPMENTAL AGE (Months)

Case No.	Birth Wt. lbs. & ozs.	Chronological Age, Reckoned in Months from Birth						
		6 mos.	9 mos.	12 mos.	15 mos.	18 mos.	24 mos.	30 mos.
Girls under 4 lbs. at Birth								
51	2-4	3.5	--	--	--	--	--	--
58	2-5	--	7.2	10.7	12.5	15.9	21.0	--
73	2-5	3.2	6.9	--	--	15.1	--	--
52	2-6	4.2	7.6	10.7	12.5	14.3	24.0	--
89	2-8	5.2	7.5	10.4	--	--	--	--
90	2-11	4.1	--	9.3	--	--	--	--
23	2-15	--	--	14.3	18.7	23.9	26.3	--
87	2-15½	3.7	--	--	--	--	--	--
71	2-15½	4.2	8.0	10.7	--	--	--	--
62	3-1½	5.5	9.5	12.9	--	18.7	--	--
1500 grams								
68A	3-6	4.2	8.1	12.7	--	16.8	--	--
67	3-6½	--	10.5	--	--	21.7	--	--
206	3-11½	7.0	unsat.	11.4	--	21.7	29.4	--
82A	3-12	--	9.1	13.2	15.1	--	--	--
16	3-13	--	--	--	--	12.9	16.7	--
79	3-15	4.3	7.5	9.2	10.0	14.8	--	--
95	3-15½	4.5	--	--	--	--	--	--
Total Cases-17		12	10	11	5	10	5	
Median	2-15½	4.2	7.8	10.7	12.5	16.4	24.0	
Retardation in mos.		1.8	1.2	1.3	2.5	1.2	0.0	
Girls over 4 but under 5 lbs. at Birth								
68	4-1	4.6	7.9	12.2	13.0	--	--	--
9	4-2½	--	--	10.7	13.5	17.9	--	--
71A	4-3½	3.9	7.1	11.0	--	--	--	--
88	4-5	6.7	10.8	14.3	15.1	--	--	--
59	4-5½	5.7	unsat.	10.5	unsat.	unsat.	--	--
2000 grams								
94	4-8	6.4	8.3	--	--	--	--	--
65	4-9	2.9	6.4	9.3	12.2	18.3	--	--
38	4-10	--	--	10.4	10.9	13.7	19.0	--
78A	4-10½	--	8.7	11.8	unsat.	--	--	--
204	4-11	6.1	9.9	14.3	--	22.0	30.0	--
74	4-11	6.2	10.0	13.1	18.4	23.0	--	--
66	4-13	5.5	9.4	14.2	18.8	23.0	--	--
34	4-13½	--	--	13.0	18.0	19.2	24.0	--
10	4-14	--	--	--	--	18.8	23.4	--
232	4-14	5.1	9.1	11.5	--	16.5	23.1	--
233	4-15	5.3	9.0	11.9	--	16.9	22.9	--
19	4-15	--	--	12.0	--	17.2	25.0	--
69	4-15	6.1	--	--	--	--	--	--
48	4-15½	--	11.2	13.7	17.7	21.5	30.0	--
Total Cases-19		12	12	16	9	12	8	
Median	4-11	5.6	9.1	12.0	15.1	18.6	23.7	
Retardation in mos.		.4	.1	0	.6	.6	.3	
Term Babies		6.6	10.0	13.3	--	19.3	26.0	

TABLE 1 - Continued

Birth Injury	Toxemia	Resuscitation	Notes
Girls under 4 lbs. at Birth			
--	--	--	Case not followed after 6 mos.
--	--	--	Stubby fing., paddle-like gest., borderline
--	Pre-ecl. II	--	Distractible
--	Puer. sep.	--	Petulant gestures with hands
--	Pre-ecl. II	--	Nervous, overstimulated by mother
--	--	--	Alert, eager, seems normal
--	--	--	Full term by Mother's calculations
--	--	--	Looks Chinesey
--	--	--	Always seems sleepy
--	--	Suction	Cooperative, responsive
1500 grams			
--	Pre-ecl. II	CO_2	Shy at 18 mos.
--	--	--	Prolonged illness, 12-15 mos.
--	Pre-ecl. II	--	Socially immature at 3 yrs.
--	Pre-ecl. I	--	Interested in test
--	--	--	Seems feeble-minded
Caesarean	Pre-ecl. II	--	Seems definitely retarded
Caesarean	Pre-ecl. I	--	
Girls over 4 but under 5 lbs. at Birth			
--	Pre-ecl. II	--	Shy at 18 mos. Twin to 68 A
--	--	CO_2 & tub	
--	Pre-ecl. II	--	Twin to 71
--	--	--	Very alert, possibly full term
Jaundice	--	--	Extreme shyness
2000 grams			
Caesarean	Pre-ecl. II	--	Case not followed after 9 mos.
--	--	--	Seemed feeble-minded till 18 mos.
--	--	--	Definitely retarded
--	Pre-ecl. I	--	Extremely shy
--	Pre-ecl. II	--	Excellent cooperation
--	Pre-ecl. II	Suction, Tubbing & CO_2	Advanced in speech
--	--	--	Alert, eager child
--	--	Suction, Tubbing & CO_2	Seems brighter than score
--	Pre-ecl. I	--	Responsive
--	Ppart. ecl.	Suction, Tubbing & CO_2	Identical twins
--	Ppart. ecl.	Suction, Tubbing & CO_2	" "
--	Pre-ecl. II	--	Only partial cooperation
--	--	--	Case not followed after 6 mos.
--	--	--	Alert though shy

Note: For Key to abbreviations see Table 2.

TABLE 2

MENTAL GROWTH OF PREMATURE BOYS--DEVELOPMENTAL AGE (Months)

Case No.	Birth Wt. lbs. & ozs.	Chronological Age, Reckoned in Months from Birth						
		6 mos.	9 mos.	12 mos.	15 mos.	18 mos.	24 mos.	30 mos.
Boys under 4 lbs. at Birth								
84	2-1	3.9	7.8	9.7	14.3	20.0	--	--
215	2-4½	4.6	8.8	10.2	--	14.7	22.2	32.7
1500 grams								
191	3-6	4.9	8.5	12.1	--	17.2	21.8	--
75	3-8	4.1	--	11.6	15.5	19.9	--	--
80	3-9	4.6	--	--	--	--	--	--
85	3-10	2.8	2.8	8.7	8.3	--	--	--
91	3-14	8.3	--	15.4	--	--	--	--
228	3-15	6.7	9.6	11.2	--	16.0	21.8	--
53	3-15	6.3	10.1	--	--	--	--	--
Total cases-9		9	6	7	3	5	3	1 34
Median 3-9		4.6	8.6	11.2	14.3	17.2	21.8	
Retardation in mos.		1.4	.4	.8	.7	.8	2.2	
Boys over 4 but under 5 lbs. at Birth								
81	4-1½	5.5	9.1	11.4	15.9	--	--	--
17	4-2	--	--	--	--	13.1	17.5	--
50	4-3	4.6	--	10.8	13.0	17.7	21.0	--
61	4-5	5.2	8.9	12.6	14.9	17.7	--	--
46	4-5	5.5	--	12.0	--	--	--	--
60	4-6	4.3	8.7	12.0	14.7	16.1	--	--
2000 grams								
92	4-7½	6.5	8.8	11.9	--	--	--	--
86	4-9	4.4	10.6	11.4	17.9	--	--	--
83	4-11	4.7	7.8	10.7	14.9	--	--	--
77	4-11	8.0	10.1	14.2	16.0	20.0	--	--
2	4-11	--	--	--	16.7	20.6	30.0	--
76	4-12	6.0	9.2	11.7	15.9	18.6	--	--
8	4-12½	--	--	10.4	10.1	17.9	24.0	29.0
56	4-13½	5.2	--	11.8	14.6	17.8	24.0	--
25	4-14	--	--	9.5	11.6	16.3	19.5	--
57	4-14½	3.6	--	--	--	--	--	--
55	4-15	6.0	10.1	12.4	16.8	22.6	30.0	--
4	4-15	--	--	12.0	--	--	--	--
Total cases-18		13	9	15	13	11	7	1 69
Median 4-11		5.2	9.1	11.9	14.9	17.9	24.0	
Retardation in mos.		.8	.1	.2	.1	.3	3.0	
Term Babies		6.7	9.5	12.9	--	20.2	26.8	

TABLE 2 - Continued

Birth Injury	Toxemia	Resuscitation	Notes
Boys under 4 lbs. at Birth			
Hyperemesis. Left as stillborn. When starting to prepare for morgue, 1 hr. later, found alive.			Gives impression of brightness
--	Toxemia	--	
1500 grams			
--	--	Suction	
--	--	--	No words at eighteen months
--	--	--	Case not followed after 6 mos.
--	--	--	Feeble-minded
--	Pre-ecl. I	--	Very superior, trembled
--	Toxemia	--	
--	Pre-ecl. I	--	
Boys over 4 but under 5 lbs. at Birth			
--	Pre-ecl. I	--	Cooperative
--	--	--	Feeble-minded. Twin of 16
--	--	Suction	Stubborn, refused to talk at test
Caesarean	Pre-ecl. I	--	Mother urges
--	--	--	Eager
--	--	--	Lazy at last test
2000 grams			
--	Pre-ecl. I	--	Looks brighter
--	--	--	Lazy at last test
--	--	--	Lacks zest in test
--	--	--	Alert (colored)
--	Pre-ecl. I	--	Advanced
--	Pre-ecl. II	--	
--	--	Suction	Responsive
Caesarean	--	Tub, CO_2 Suction	Ill between 15 and 18 mos.
--	--	--	Seems retarded
--	--	--	Case not followed after 6 mos.
Cer. edema	--	Tub, CO_2 Suction	Alert, bright
--	--	Suction & CO_2	Looks bright

Key to Abbreviations

Pre-ecl. I: Either albuminuria or elevated blood pressure during preg.
Pre-ecl. II: Both albuminuria & elevated blood pressure during preg.
Puer. sep. : Puerperal sepsis.
Cer. edema : Cerebral edema.

The test applied to these children, a modification of the Yale Developmental Schedule, was worked out by Cattell (3) for use with the normal series of children under observation at the Center. The chief advantage of this scale over existing infant tests are that postural and locomotor items -- sitting, creeping, standing, and walking -- in which premature babies are particularly slow, do not enter into the developmental score; and that a month by month scoring system has been devised so that developmental ages may be computed. The preliminary scaling of items was made on the basis of the tests given the first hundred babies enrolled at the Center, and tentative norms were thus established. When this scale was applied to the second group of babies in the normal series, they scored somewhat higher, on the average, than the tentative norms. This discrepancy between age in months and developmental score has been corrected as far as possible in the final revision of the scale. The preliminary scale was utilized in testing the premature babies, in order that their scores be directly comparable to those of the babies in the normal series. It is not claimed that the developmental ages as reported are entirely accurate, but it seems likely that they are in error only a few tenths of a month at each age, and hence that they are accurate enough to enable one to judge of the degree of retardation of individual cases.

The developmental ages for all examinations on the 63 children are given in Tables 1 and 2. The sexes are listed separately, and the cases are arranged in order of birth weight, which is given in pounds and ounces in the second column. Sub-groupings have been made for birth weights under and over four pounds. For the benefit of those who are accustomed to thinking of birth weights in terms of grams, heavy rulings are made at the orientation points 1500 and 2000 grams. The lower birth weights are more prevalent among the girls; ten girls of birth weights under 1500 grams, but only two boys of this weight are included in the group. Division of the group at four pounds birth weight furnishes groups of sufficient size for medians to have some significance.

The median developmental ages given at the end of each series of cases indicate that prematures of birth weights under four pounds are retarded by a month or more throughout the eighteen month period. At two years, cases are too few to permit a judgment to be made, but at this age the girls, though smaller and more retarded up to fifteen months, seem to have surpassed the boys and to approximate their birth age in development. The reversal of the sex difference at this age is undoubtedly due to the well known sex difference in language development in favor of the girls; girls talk earlier than boys, and speech comprehension and usage plays an important part in the twenty-four month examination. Median developmental ages for babies of birth weights between four and five pounds show retardation of less than a month at six months and no appreciable discrepancy from the birth ages thereafter. In other words these larger premature babies catch up with their age group within the first nine months of life. Sex differences are negligible through twelve months, and thereafter the girls tend to exceed slightly, which again may be attributed to their superiority in speech development.

If, however, the premature groups are compared with the babies of the normal series, even those of birth weights over four pounds are a month retarded throughout the eighteen month period. There is some evidence, however, that the babies of the normal series represent a better sampling of the population than do the prematures. They include few Italian children, whereas a number are included in the premature group; and the socio-economic status of the parents of children in the normal series is better in general than that of the prematures. Consequently, it is likely that the babies of the normal series are somewhat above the general population in average development, and that, as their scores suggest, they are accelerated about half a month at six months,

a month at twelve months and two months at two years; i.e. that their developmental quotients at each age center about 108 instead of about 100.

Item Analysis: The items composing the developmental scale consist largely of visual-manual tests at the age of six months. At ages nine and twelve months an increasing proportion of non-manipulative tests are given; these items in general require the child to "see the point" in a demonstration, or to comprehend simple directions given by the examiner. The baby's ability to use speech, as reported by his mother, begins to play a part in the test at twelve months, and becomes fairly important at eighteen months. The items are grouped roughly under these categories in Table 3, which presents comparative data on the two groups of prematures and the normal series.

At age six months the three groups are definitely differentiated from one another in every manipulative item; the group of larger prematures consistently exceeds the group of smaller prematures, and the normal series exceeds all the prematures in the per cent of cases passing. In the non-manipulative items at this age, the differentiation is less clear-cut; the babies of the normal series excel over the prematures in each item, but larger prematures hold only a very slight lead over the smaller prematures.

At nine months the gaps between the three groups in per cent of cases passing each manipulative item have begun to close. The differences are still in the general direction favoring a greater number of successes among infants of greater birth weights, but the degree of difference is somewhat smaller. The non-manipulative items at nine months show even less clear-cut differentiations among the three groups; in fact, there are a few reversals in direction of the differences. Unfortunately, none of the items can be considered primarily social in nature, but the item "adjust to gesture" which includes tricks such as waving bye-bye, and playing pat-a-cake has a large social element. In this item and that of imitating sounds, the larger prematures are the equals of term babies.

By twelve months the differences between term and larger premature babies has further decreased in most items, but the smaller prematures are still somewhat less successful. Reaction to the pellet is probably the one behavioral item most suitable for diagnosing prematurity at the ages of nine and twelve months. Picking up the pill requires no particular strength, and it has sufficient interest for the child to be attempted at these ages. The pincer grasp, however, cannot be executed until neuro-motor development has progressed to a stage that enables the child to divorce his index finger from the other digits, a stage that normally occurs around ten months. Babies that are able to execute pincer prehension at the age of nine months probably are not true prematures, and conversely at twelve months babies that attempt this test with interest but fail it from lack of skill in opposing the thumb and first digit probably are retarded in neuro-muscular development with premature birth as a likely cause.

Manipulating objects in imitation of the examiner or at her command show only slight differentiation among the three groups at twelve months. In speaking vocabularies of one and two words, the three groups are rather clearly separated, but vocabularies of three words or more are accomplishments of about equal frequency for babies of all birth weights. The lead in obedience to the command "No-no" seems to be held by the tiniest babies; this item, as well as that of vocabulary, is obtained from mothers' reports, and it is possible that the mothers of small babies who are not doing quite as well on other test items more often give favorable reports on this. Vocabulary is less subject to the mother's interpretation than the "No-no" reaction, since in the vocabulary test she must name the words the baby uses with meaning.

At eighteen months the three groups are fairly well differentiated on manipulative items, but show no definite trends on items that combine manipu-

TABLE 3

COMPARISON OF DEVELOPMENT IN INDIVIDUAL TEST ITEMS
PER CENT OF CASES PASSING

Manipulative Items - 6 Mos.	Premature Series		Normal S.*	Manipulative Items - 9 Mos.	Premature Series		Normal S.
Birth Wt.	Under 4 lb	4-5 lb	Over 5 lb	Birth Wt.	Under 4 lb	4-5 lb	Over 4 lb.
Recovers rattle from chest	45.5	85.2	98.4	Spoon, bangs	62.5	80.0	96.4
Picks up a cube on contact	50.0	80.8	100.0	Paper, exploits	66.7	95.0	98.8
Active play with rattle	50.0	77.0	95.9	Cube, takes two	81.3	89.5	92.8
Rattle, obtains at shoulder	30.0	52.0	83.7	Hand preference	62.5	88.9	78.9
Rattle, attains lying	33.3	63.0	88.6	Ring, pulls by string	56.3	76.3	84.0
Picks up cube on sight	25.0	50.0	79.0	Cup, lifts by handle	87.5	84.3	84.0
Cube, holds up two	33.3	51.8	91.1	Pellet, rakes	46.6	66.7	91.6
Lifts cup	31.3	39.3	78.5	Pellet, scissors grasp	26.7	33.3	75.2
Ring, pulls down	31.6	64.4	80.3	Pellet, plucks	6.7	19.1	26.8
Spoon, picks up	26.3	67.8	84.8	Drops cube for third	43.8	62.0	52.5
Transfer object	27.8	51.8	86.8	Doll, squeezes	22.2	57.2	50.0
Paper crumples	15.0	46.4	83.5	Cube and cup, combines	18.8	47.6	32.2
Unilateral reaching	13.6	37.1	62.6	Spoon, hits cup with	20.0	35.0	34.6
Hand preference	9.5	23.1	45.8				
Reaching accurate	10.0	19.2	53.4				
Cube, picks up deftly	0.0	8.0	37.4	Non-Manipulative Items - 9 Mos.			
				String, interest in	73.4	76.3	79.9
Non-Manipulative Items - 6 Mos.				Bell, interest in details	50.0	47.6	82.1
				Spoon, looks for hidden	66.7	90.0	74.8
Pellet, regard	37.8	38.5	84.1	Words: "da-da"	56.3	76.3	82.3
Pellet, attempts	10.0	11.1	57.7	Bell, rings in imitation	56.3	52.4	58.5
Mirror, approach	50.0	57.2	79.7	Adjust to gestures (bye-bye, etc.)	42.8	57.2	75.6
Mirror, pats and smiles	22.7	32.1	49.7	Adjust to words	50.0	66.7	63.3
Bell, turn to	42.1	84.6	89.1	Imitate sounds	53.4	76.3	65.2
Reaching, persistent	26.1	29.6	61.6	Box and stones, memory	0.0	35.7	15.2
Ring, pulls persistently	18.2	23.1	50.6	Toy, uncovers	35.7	57.1	58.5
Ring, inspects with attention	18.2	14.8	48.8	Words, one	0.0	23.8	12.3

* Average birth weight for babies of the Normal Series: Boys 7-14, Girls 7-10.

TABLE 3 - Continued

Manipulative Items - 12 Mos.	Premature Series		Normal S.
Birth Wt.	Under 4 lb	4-5 lb	Over 5 lb
Pellet plucks	73.4	67.7	88.8
Pencil, marks	33.3	23.4	67.2
Spoon, rattle in cup	26.9	48.4	58.4
Bottle, poke finger in	23.1	50.0	50.0
Cube, take third	28.6	25.5	40.0
Cube, unwraps	30.8	45.1	29.9
Fits round block into hole	7.1	16.1	29.6
Pellet, bottle, solves	0.0	20.0	12.6
Drops beads in box	0.0	6.9	25.0
Tower of two cubes	0.0	9.7	11.2
Non-Manipulative Items - 12 Mos.			
Doll, hits in imitation	50.0	66.7	68.9
Words, one	33.3	50.0	79.5
Words, two	21.4	45.1	60.0
Words, three	21.4	32.3	39.9
Words, four	21.4	22.6	30.0
Words, five	13.3	6.7	16.8
Obtains cube hidden under cup	73.4	86.7	81.1
Puts cube in cup, one	66.7	80.6	68.2
Puts cube in cup, two	14.3	16.0	22.7
Hits spoons together (imitate)	53.9	65.7	66.3
Cup, take a drink	45.2	50.0	50.0
Obeys "no-no!"	92.4	65.5	80.4
Obtains object behind glass	0.0	18.5	24.3

Manipulative Items - 18 Mos.	Premature Series		Normal S.
Birth Wt.	Under 4 lb	4-5 lb	Over 4 lb.
Pencil, marks	78.6	90.5	10.0
Pencil, scribble	42.9	71.5	70.3
Peg board, 1 peg	78.6	95.3	100.0
Peg board, 2 pegs	71.5	80.0	94.8
Peg board A, completes	42.9	60.0	74.0
Peg board B, completes	28.6	45.0	41.5
Drops beads in box	71.5	94.7	92.6
Puts lid on round box	60.0	92.9	85.9
Fills cup with cubes	64.3	61.9	76.3
Pellet, pours from bottle	71.5	75.0	82.7
Cubes, lower of two	64.3	76.2	87.0
Cubes, lower of three	28.6	38.1	56.3
Cubes, lower of four	28.6	15.8	35.8
Cubes, lower of six	28.6	5.0	
Items Requiring Manipulation & Insight - 18 Mos.			
Form board - round block	85.8	72.7	94.5
Form board - round hole reversed	61.5	60.0	76.6
Form board, square	38.4	47.6	45.4
Form board, solves	28.6	33.3	17.8
Form board, reversed	0.0	9.1	1.8
Obtain toy with stick	33.3	66.7	55.8
Delayed response	46.1	40.0	53.8
Speech - 18 Mos.			
Words, two	78.6	100.0	99.2
Words, three	71.5	81.0	94.1
Words, four	64.3	80.0	89.0
Words, five	64.3	76.2	80.5
Joins two words	14.3	23.8	34.1
Simple sentences	7.7	0.0	10.8
Asks with words	35.7	42.8	65.2
Comprehension - 18 Mos.			
Doll, points to parts	53.8	30.0	63.3
Picture, points to one named	50.0	40.0	63.8
Doll, puts in chair	23.1	42.9	66.0

lative skill with a certain amount of insight or ability to generalize or remember (form-board, delayed response, using stick as a tool). In use of speech the babies of lowest birth weight are poorest and those of the normal series are best. In comprehending and complying to simple directions, however, the smallest babies have no clear handicap.

On the whole the item analysis confirms the findings of other authors that prematurity manifests itself more definitely in motor than in non-motor development. It fails to show that the prematures as a group have any social advantage over term babies by virtue of their having been born into the world of people at an earlier age. Accelerated premature babies, however, do show more acceleration in social than in manipulative items.

Sex Differences: Tabulation of the successes by sex reveals no consistent sex differences on the majority of items at each age, but a few items do show sex differences for the premature babies. At six months there are fourteen items in which boy prematures achieve more successes than girl prematures and no item in which the girls consistently excel. At nine months only eleven items show sex differences, and nine of these favor the boys. At twelve months, however, the trend in sex differences is reversed, the girls exceeding the boys in thirteen of the fourteen items wherein consistent sex differences are shown. At eighteen months sex differences appear in fifteen items, the girls excelling in eight items, and the boys in seven. At twelve and eighteen months girl prematures consistently excel boys in the speech items. Separate tabulations by sexes are not available on the normal series for comparison. It seems probable, however, that the sex differences favoring boy prematures at the ages of six and nine months are largely attributable to the fact that there are fewer boys under three pounds in birth weight. The superiority of the premature girls at twelve months occurs chiefly in language items. It is likely that the condition which obtains at eighteen months, wherein boys excel girls about as often as girls excel boys, represents the truth about sex differences in these items.

Individual Cases: The generalizations made in the foregoing paragraphs are subject to a number of individual exceptions. One is prone to think of the premature baby as developing more rapidly than the term baby and thus gradually over-taking the group of babies of his own birth age. This generalization apparently holds when group results are considered. Individual cases, however, do not bear out this conclusion. Twelve of the 63 premature babies examined, 9 girls and 3 boys, manifested definite acceleration in development during the period under observation; in these cases[4] the acceleration was noted at the nine month examination, and all but one[5] that eventually became accelerated were at least up to birth age in accomplishment by six months. The acceleration in development therefore appears to manifest itself within the first nine months of life. Conversely, premature babies that had not caught up with their age group by nine months remained retarded at least up to two years. There is only one instance of a premature baby (Case 65) showing definite retardation through the fifteen month examination, and suddenly blossoming to normality at eighteen months. The stability of her new rating needs verification by a later examination. In her case, however, it is possible that the sudden improvement is to be explained by the fact that the mother was hard pressed with a family of young children and therefore gave the baby a minimum of attention and stimulation so long as she was contented to lie in her crib. Once the child achieved walking, however, she began to play on the floor with her older brothers, and developed rapidly through contact with them. At least the mother remarked, "Oh, she's getting to be a rogue now;

[4]Three cases were not tested as early as nine months.

[5]Nancy C. whose six month rating was five and a half months.

she's into everything along with her brothers!"

Only one child of birth weight under three pounds (Case 23) was consistently accelerated, but unfortunately, she was not tested at ages six and nine months. In view of her high scores it is interesting that the mother insisted that according to her calculation the child was full term to a day, although the medical record gives an estimate of seven and a half months gestation. Three other babies who were accelerated (Cases 34, 67, and 88) were thought to be only a week or two premature. Girl 66 is one of the most interesting cases, because she has rather consistently gained ground; her developmental quotients from six to eighteen months are respectively 92, 105, 119, 125, 130. She was estimated as seven weeks premature, and although she had practically caught up with the normal group at six months, she continued to gain throughout the period tested. Paul B., the smallest baby of all, showed remarkable gain between twelve and fifteen months, and he seems likely to equal his birth age by eighteen months.

Of the retarded children at least five seem unquestionably subnormal; these are Numbers 38, 85, 16, 17, and 79. In the case of boy 85, four siblings impress the home visitor as subnormal, so his retardation probably is not attributable entirely to prematurity. The prognoses for Cases 59 and 78A are not very good. These little girls exhibit high irascibility, bursting into tears and actively withdrawing from friendly overtures of the examiner at twelve months. No. 59 in particular held her arms flexed and abducted in the characteristic newborn posture, though she apparently was interested in the toys, and sometimes reached when the examiner pretended not to be looking.

Nervous mannerisms of prematures: A number of peculiar gestures and nervous mannerisms are observable in these premature babies; the examiner is under the impression that the frequency of these gestures is greater than among normal babies. Of the 63 babies examined, 10 had too few examinations for any personality traits or nervous mannerisms to be manifested consistently. For the remaining 53 cases a total of sixty-two nervous mannerisms have been noted. No nervous mannerisms have been reported for 10 of the children, but whether their reactions are entirely wholesome or whether their nervous mannerisms merely excaped the examiner's attention it is impossible to say. This leaves 43 children on whom some notations of tension of one sort or another have been made. For 10 children the notation "extremely alert and responsive" suggests an over-eager, hyperactive reaction to the test situation.

"Shyness" is the most frequent notation; twelve premature babies have manifested a degree of shyness that interfered with the success of the test, at least initially. A sort of dogged determination not to comply to directions has been manifested by ten prematures. This reaction can best be described by quoting excerpts from the notes.[6]

1. "Merle (2 yrs.) either could not or would not talk; her refusal seemed less from shyness than from deliberate determination not to talk."

2. "Nancy (12 mos.) hesitates before taking an object and doing what she is well aware is expected of her. It is as if she really desired to imitate but refrained from it because she did not want to be a copy-cat."

   "Nancy (15 mos.) would start to take a toy then with-

[6]Each notation was made immediately after the test, and the examiner took scrupulous care not to consult the previous records before making her notes. Consequently, the consistency of the notations from age to age has real significance.

draw, apparently not from fear, but often from reluctance to comply with an adult's wishes."

3. "Mary (9 mos.) kicked eagerly with her feet when toys were presented, but held both fists clenched in hard knots, and made no sign with her face or hands that she wanted a toy."

   "Mary (12 and 18 mos.) withdrew arms when toys were offered. When she took one, she would not give it up for another."

4. "Richard (18 mos.) has a slight stubborn streak."

   "Richard (2 yrs.) refused to talk; ignored directions rather than failed to comprehend them."

Peculiar gestures with the hands have been noted for ten babies. Those of Mary have been described above. Paddle-like gestures with the hands have been noted on Veronica, Alice, and Mary. Janice exhibited a petulant grasping reaction, opening and closing her hands rapidly till she got what she wanted. Others slapped, slashed, and banged toys, and Richard, when presented with a toy at fifteen months, "took it and turned it over and over, looking at it from all angles, but his activity was less exploratory than it seemed, for after looking he did nothing else. The turning was merely an idle gesture."

Hypersensitivity to sounds has been noted on six premature babies; footfalls or voices in the corridor distracted them from the test. Robert and Frank continued to show exceptional distraction to sounds at two and a half and three years respectively. Indeed, the noise of a book's being dropped on the floor caused Frank, aged three years, to exclaim, "That's a bomb!"

Nine premature babies have been extremely irascible, bursting into tears at the slightest provocation, as for example, when one toy was taken away, even though another was proffered at the same time. Five have been described as "nervous" or "jittery" babies; some have shuddered or trembled at the tests.

While similar manifestations have also been seen in babies of the normal series, they have not been observed as frequently as among prematures. The paddle-like hand gesture occurred in only one baby of the normal series, and she has proved to be feeble-minded.

Maternal Training of Premature Babies: The high incidence of "nervous" behavior in premature babies suggests either that they inherit less stable nervous systems than do babies born at term, or that exposure to external stimulation at a time when they normally would be enjoying the tranquility of intrauterine environment is hard on underdeveloped nervous systems. Possibly the environmental milieu of the premature is entirely responsible for their development of nervous mannerisms. The staff members who come in contact with the mothers of these babies are under the impression that they are considerably more anxious than mothers of babies in the normal series. Mothers of prematures hover over the infant with great solicitude, and they go to extremes of over- or under-stimulation in his care. The mothers recognize the baby's precarious condition, and at first are over-zealous in sheltering him from stimulation, perhaps protecting him more than need be. As the baby grows and approaches the normality in size and development, mothers often grow eager for him to close the gap entirely, and they over-urge the child; they are particularly likely to do this when the baby's intellectual grasp

exceeds his manipulative ability. At least five of the mothers have interfered in the testing situation by over-urging the child to attempt things just beyond his level of accomplishment.

The age of the mother, and her experience with or expectancy of other children unquestionably influences her attitude toward the premature. A number of the babies are the first-born children of mothers in the middle thirties or beyond, and in some cases the child is the first viable baby from a series of pregnancies. Such mothers naturally are over-anxious lest they never be able to have another baby should something happen to this one. The mother of one of the prematures died at the baby's birth, leaving the child to be reared by a devoted father, a fussy paternal grandmother and a series of nursemaids. The mothers of the ten babies on whom no nervous mannerisms have been noted are either under thirty, or have other living children.

In their follow-up study of older premature babies Hess, Mohr, and Bartelme (5) discovered an excess of nervous habits in prematures as compared to their term siblings. Apparently, therefore, nervous habits not only are engendered in infancy but also persist and are extremely difficult to break. This is particularly true of thumbsucking and of bladder incontinence. In consideration of the greater hazard in developing nervous behavior it would seem that mothers of prematures need a different type of mental hygiene from that given to mothers of term babies. Probably they should be discouraged from regarding and treating the baby as unusual or exceptional to any greater degree than necessary. They should realize that by allowing the baby to set his own developmental pace they are probably reducing to a minimum the hazard prematurity imposes on normal emotional development. They should be assured that his chances for making up his intellectual discrepancy are good, but they should not be given too much hope for eventual acceleration if he remains "backward" beyond the age of two.

SUMMARY

The results of 215 developmental tests administered to 63 babies of birth weights under five pounds indicate:

1. That babies of birth weights under four pounds are retarded by a month or more through the eighteen month period, whereas babies of birth weights four to five pounds overtake the normal group by nine months of age.
2. That premature babies are more retarded in manipulative development than in intellectual grasp and social responsiveness.
3. That 10 per cent (six cases) of the group showed definite acceleration by the age of nine months; and that an equal number showed such consistent retardation throughout the period of testing as to warrant the prediction of feeble-mindedness.
4. That premature babies manifest more "nervous" mannerisms than babies born at term.
5. That primaparity, advanced age of the mother, and twinning, all of which are more common conditions among prematures than among normal babies, predetermine for the premature a somewhat unusual environment that may foster the development of nervous habits.

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A SUPERIOR CHILD WHO WOULD NOT TALK

MELVIN G. RIGG[1]

Size of vocabulary has been regarded as the best single indication of intelligence. The failure of a child to develop normally in this respect would consequently appear to be a very bad sign. Occasionally, however, we find a child who breaks all the rules, and Carolyn is a case in point.

At the age of two Carolyn could say only thirteen words, as follows: bread; butter; bye; daddy; gak (milk); here; is; it; mother; there; wow-wow; Gaga (Arthur); Gak (Jack).

The writer has made little attempt to indicate how these words actually sounded. The child's pronunciation was extremely "dutchy," and the parents often despaired of being able to reduce it to exact phonetic symbols. The pronunciation did not improve greatly until she started to school at the age of six, when, under the direction of an excellent primary teacher, rapid progress was made.

Whether this faulty pronunciation was connected with the abnormally slow vocabulary development is an interesting question. No other explanation suggests itself. Carolyn is the daughter of a college professor. The mother was before her marriage also a college professor. Carolyn has a brother two years older, and has always played with other children. The home in no way presents an environment which is unusual.

The full extent of Carolyn's vocabulary deficiency can be appreciated only by a comparison with the accomplishments of other two-year-olds. After a search of the literature, the writer has found a total of thirty-three cases of two-year-old children for whom vocabulary counts have been made. These vocabularies range from 5 to 1400 words. The mean is 520 and the mid score is 507. Among these thirty-three cases, Carolyn ranks next to the lowest.

These thirty-three counts represent attempts to list the actual words in each child's vocabulary. It is true that the different totals are not directly comparable, since each investigator formulated his own rules as to what should constitute a separate word. But this consideration can scarcely cover up a discrepancy between 13 and 520 words! It is also true that most of these children are very superior in intelligence, sons and daughters of college professors, and living in homes that are above average from the intellectual point of view. But since Carolyn belongs in this class herself, the point furnishes no excuse for her poor showing.

Smith,[2] in attempting to estimate the total vocabularies of twenty-five two-year-olds by means of a vocabulary test, found a mean of 272 words. These children are presumably less brilliant than most of those for whom total counts have been made, although they were considered somewhat above average. But their vocabulary development is still far above that of Carolyn.

During her third year Carolyn made rapid progress, and at the age of three had a spoken vocabulary of 652 words. However, for nineteen published vocabulary counts of three-year-old children, the mean is 1230 and the mid score, 1139. The range is 48 to 2282.[3] Smith,[4] using a vocabulary test,

[1]From Oklahoma Agricultural and Mechanical College, School of Education, Stillwater, Oklahoma.

[2]Smith, M. E., An Investigation of the Development of the Sentence and the Extent of Vocabulary in Young Children, University of Iowa Studies in Child Welfare, v. 3, No. 5, pp. 92.

[3]The case showing only 48 words at age three is the same as the one showing 5 words at age two. This child had 1135 words at age four. Nice, M. M., A Child Who Would Not Talk, Ped. Sem., v. 32, 1925, pp. 105-142.

[4]op. cit.

estimated the average vocabulary of 20 three-year-olds to be 896 words. Drever[5] reports four slum children as averaging 376 words. Carolyn is superior to these slum children, but is inferior to Smith's cases and far behind most of the cases for whom total vocabulary counts have been made.

Even at the age of three, however, Carolyn gave evidence of intellectual superiority. She was given the Stanford-Binet test (1916 form) and earned an I.Q. of 133, passing all of the three-year tests, four tests at year four, and two tests at year five.

At the age of four, Carolyn had a spoken vocabulary of 1019 words. Twelve published vocabulary counts at this age have a mean of 2092 words, a mid score of 1818, and a range from 1019 to 4200, Carolyn's total being the lowest. Smith's[6] 26 four-year-olds were estimated to have an average vocabulary of 1540 words. Their average I.Q. was 109. Drever[7] reports five four-year-old slum children to average 451 words. Carolyn's vocabulary development is still relatively poor, especially in view of her intelligence rating.

No further vocabulary counts were made for Carolyn. She started to school at the age of six. The next spring, at the age of six years ten months, she was again given the Stanford-Binet test (1916 form). She passed all the tests at year eight, four tests at year nine, two tests at year ten, and two at year twelve, making an I.Q. of 139. She knew 20 words in the vocabulary, the norm for year eight. This fact indicates that her early vocabulary deficiency had by this time been made up. Some two months later, she was retested by a clinician at the Ohio State University, and earned an I.Q. of 137. As a result of superior work in Grade One, she was given a double promotion to Grade Three. She adjusted herself to this change and has continued to earn very satisfactory marks.

At the age of eight years ten months, Carolyn was again given the Stanford-Binet test (1937 revision). Her I.Q. was 147. This gain was of course to be expected, since the 1937 revision gives higher ratings to superior children. At this time she knew 20 words of the revised vocabulary, the norm for average adults! Her vocabulary development is now indicated as definitely superior.

In the opinion of the writer, two important deductions can be made from this case. First, even an extreme deficiency of vocabulary development at two years of age does not necessarily indicate deficiency of intelligence. Second, it does not even indicate a relative vocabulary deficiency in later years.

[5]Drever, J. The Vocabulary of a Free Kindergarten Child, J. Experimental Pedagogy, v. 5, 1919, pp. 28-37.

[6]op. cit.

[7]op. cit.

THE INTERNATIONAL KINDERGARTEN UNION WORD LIST COMPARED WITH EIGHT SPOKEN VOCABULARIES

MELVIN G. RIGG[1]

The Child Study Committee of the International Kindergarten Union (I.K.U.) has published a "Vocabulary of Children Before Entering the First Grade."[2] This "Kindergarten List" was based upon a study of 489,555 running words, of which 7,186 were different words. The list is composed of the 2,596 words which occurred seven times or more. In making this list each inflection was counted separately. However, words used as different parts of speech or in different meanings were counted only once.

The present writer has thought that it would be interesting to compare this I.K.U. list with spoken vocabularies of individual children. The eight vocabularies involved in the present study were collected from five different children at ages from two to four. In each case the attempt was made to list the child's complete vocabulary. No recording devices were available, but the child's mother made a careful record of all the different words used. This record was begun in each case four weeks before the birthday, and lasted for two weeks afterward. It is of course probable that some words were missed. To be included, the word had to be employed meaningfully by the child; words repeated parrot-like or used only in songs or nursery rhymes were not listed. It was quite allowable, however, to ask the child to name objects, and the mothers were encouraged to do this. Rules were formulated for the handling of grammatical variants. The first use of a word in any form was included in the main list. Each additional variant which was regularly formed was listed in a grammatical variant list. Irregular forms were, however, considered in all cases to be separate words, and were included in the main list. Proper names were listed separately. These vocabularies were summarized in Table 1.

TABLE 1

A SUMMARY OF EIGHT TOTAL VOCABULARY COUNTS

Name	I.Q.	Age	Main list	Grammatical Variants	Proper Names	Total
Cynthia		2	368	10	22	400
Carolyn	133	2	11	0	2	13
	139	3	643	2	7	652
	137	4	938	3	78	1019
	147					
Pernetta	139	3	1034	23	49	1106
Charles	122	3	533	18	17	568
Edward	117	3	898	15	12	925
	129	4	1392	19	158	1569

These I.Q.'s were all based on the 1916 Stanford-Binet, except the one of 147 for Carolyn, which was based on the 1937 Stanford-Binet. The gain in this rating was to be expected, since superior children are supposed to score higher on the 1937 revision. These tests were not given simultaneously with the collecting of the vocabularies; in some cases the tests were administered

[1]From Oklahoma Agricultural and Mechanical College, School of Education, Stillwater, Oklahoma.

[2]The International Kindergarten Union, 1201 Sixteenth St., N. W., Washington, D. C.

several years later. Where different quotients are listed, each one represents a separate test.

The numbers of grammatical variants seem much too low. It is of course possible that many variants used by the child were simply not noted. However, since the vocabularies were collected in each case with great care, it is more likely that these children for the most part spoke an uninflected language. It is of course certain that a great many variants were understood by the child, even though they might not have been used. The extremely small vocabulary of Carolyn at age two is the subject of a special article appearing in this journal. These vocabularies were next broken down into the various classifications of the I.K.U. list, as reported in Table 2.

TABLE 2

THE EIGHT SPOKEN VOCABULARIES ANALYZED ON THE BASIS OF THE I.K.U. LIST

I.K.U. Classification	Carolyn age 2	Cynthia age 2	Carolyn age 3	Edward age 3	Pernetta age 3	Charles age 3	Carolyn age 4	Edward age 4
1a1 (first 100)	5	49	65	85	85	61	82	92
1a2 (second 100)	2	40	52	68	71	57	76	83
1a3 (third 100)		31	41	57	72	46	66	80
1a4 (fourth 100)	1	27	49	60	66	38	66	81
1a5 (fifth 100)	1	23	35	46	55	28	49	63
1a (first 500)	9	170	242	316	349	230	339	399
1b (second 500)		95	144	170	201	118	208	263
2a (third 500)		40	69	99	133	56	118	168
2b (fourth 500)		27	44	65	82	39	73	119
3a (fifth 500)	2	15	33	55	69	29	59	97
Not in list	2	53	120	220	272	96	222	523
Total	13	400	652	925	1106	568	1019	1569

The figures in the table represent numbers of words spoken by the child. For each word in the I.K.U. list, there has been determined the frequency of its occurrence in the 489,555 running words. The one hundred most frequent words have been labeled 1a1; the next one hundred 1a2, etc.

It will be seen that, in the main, the children were most familiar with the words of greatest frequency in the I.K.U. list, since the numbers decrease, with only minor inversions, as one reads down the columns.

But perhaps the most striking feature of the table is the large number of words known by these children which were not even in the I.K.U. list. Proper names will account for only a small portion of these. The children were of course all mentally superior. In all cases the father was a college professor holding the Ph.D. degree, and the mothers were college graduates. It is possible that children reared in an environment which was somewhat less intellectual might not know so many of these less frequent words.

THE EDUCATIONAL ACHIEVEMENT OF GIFTED CHILDREN

GERTRUDE HILDRETH[1]

Annual cumulative achievement records obtained with the Stanford Achievement Test at the Lincoln School of Teachers College since 1922 afford an opportunity to study achievement growth in gifted children. There are records for fifty-one children who measured between 130 and 140 I.Q. on the Stanford-Binet 1916 Scale who have had three or more annual Stanford Achievement Test records since the end of the second or third grade. There are 36 pupils who have tested 140 I.Q. or higher who have had three or more annual Stanford Achievement Tests. Similar records are also available for average children in the same population testing below 110 I.Q. who serve as controls for the gifted pupil groups. Records for fifty such cases are included in this report. The achievement tests were administered uniformly in May of each year. The data presented here include every case of a child in the school testing over 130 I.Q. or below 110 whose Stanford Achievement records were adequate for our purpose according to the criteria already stated.

The Binet tests were administered by well-trained examiners, in most cases shortly after the child's admission to the school or during the lower elementary school years. The age at which the child was tested varied somewhat with the different cases.

CUMULATIVE RECORDS FOR THE THREE GROUPS

The groups will be referred to as G1, signifying the gifted group rating between 130 and 140 I.Q.; G2, the group testing over 140 I.Q.; and Group A, the average or control group. Table 1 shows the distributions of grade scores for the three groups in reading; Table 2, for arithmetic; and Table 3, for spelling. The median curves illustrating these data are shown in Figure 1. The number of frequencies is not always identical with the total number of cases studied in each group because pupils whose records were otherwise regular missed an occasional test. In some instances a pupil missed all the tests in a given year, yet had all the following tests for several years in succession. Decreasing numbers of pupils had complete cumulative records for from four to eight years. The decreasing numbers in each column as the upper grades are reached indicate the comparatively smaller numbers of children with complete records for the later years. All records for children who had not had the initial tests during the second or third grade were excluded.

Table 4 shows the ages for the children in all three groups in May of the third grade and the distribution of I.Q.'s for the three groups.

Figure 2 shows the individual achievement growth curves for five cases testing below 110 I.Q., five above 130 I.Q., and five testing between 118 and 122 I.Q. from the same school population in the three subjects combined. The I.Q. range 118-122 presents the average tendency in learning for the school as a whole. Data for the entire school population in this I.Q. range are not included in this report.

INTERPRETATION OF THE RECORDS

Does I.Q. count in school achievement? These data prove that it does. The records indicate that Group G2 is consistently higher than the other two groups, throughout the grades represented. The difference is greatest in the

[1]From Lincoln School of Teachers College, New York City.

TABLE 1

DISTRIBUTION OF STANFORD ACHIEVEMENT TEST READING SCORES

Grade Score	A							G-1							G-2						
10.0+				1	5	9	15			4	13	20	25	21		1	4	19	20	18	8
10.0						3	1			1	1	2	3				4	3	2	1	
8										3		3	1	1		1		1			
6					2		3			2	1	2	1	1			2		2		
4				1	2	2	1			1	2	2					1	2	2		
2				1	1	2				1	3	3				2	3	1	2		
9.0					1	4					1	1					1	1	1		
8					1						3	1					2	2	1		
6					2					1		1	1				2				
4				1	1		1			4	2	1									
2				1	2					2	1						1				
8.0				3						1	3						2	1			
8			1	3	2	2			1	4							2				
6				1	1	1			1		1						2				
4			2	1	3					1	2					1	2	1			
2			1	1	1	1				2	1										
7.0				3	2	1				4	2										
8			1	2		1											1	1			
6			2	4	2					2	1					1	1				
4				2					1	2	1						1				
2			4		1	1			1	1	2					3					
6.0			1	2	1					3						4					
8			4	4					3	2	1					2					
6			5	4					4	3					3						
4		2	3	2	1				5	1					1	1					
2		1	3	2				1	5	1					2	5	1				
5.0			4					2	4	1						3					
8			2	2		1		2	3	2					2	2					
6		2	3	2					3	1					1	2	1	1			
4	1	5	1	1				3	5						3	1					
2		4	3					4	4						1	2					
4.0	1	8	1		1			5	3						2	1					
8		5	2					1	4								1				
6		2	2					2							2						
4	2	3	2					2	1												
2	1	4	1	1				2	1						1						
3.0	5	2						5								1					
8	10	7						4	1						2						
6	4	1						2													
4	14	1						2							2	1					
2																					
2.0																					
Grade	2	3	4	5	6	7	8	2	3	4	5	6	7	8	2	3	4	5	6	7	8
N	38	47	48	45	32	28	22	37	50	50	41	36	31	23	22	34	34	33	30	19	8
Median	2.6	3.9	5.4	6.6	8.3	9.4	10.0+	3.8	5.0	7.4	9.1	10.0+	10.0+	10.0+	4.5	5.4	8.8	10.0+	10.0+	10.0+	10.0+

reading scores, next largest in spelling and smallest in arithmetic. Slight inconsistencies which appear in several of the higher grade levels may be attributed to the smaller numbers of cases involved. The gifted group G2 shows the most rapid acceleration toward maturity in the achievement measured by the test, the average group the least rapid acceleration. The gifted group G2 quickly reaches a point in the reading tests where the test is no longer adequate as a measuring instrument. This point is not so quickly reached by this group in arithmetic and spelling as in reading, but is more quickly reached by group G2 than by G1, and much more rapidly than the average group. A child who attains a grade score of 10.0+ is no longer adequately measured by the test. Since group G2 was the youngest at the time of the annual test and Group A the oldest (see Table 4), the results are even more favorable to Group G2.

TABLE 2

DISTRIBUTION OF STANFORD ACHIEVEMENT TEST ARITHMETIC SCORES

Grade Score																									
10.0+					1	2	3					12	13	14				1	4	18		9	6
10.0							2				1	1	2										
8							1					1	3	2									
6														1					2			1	
4											1		1						2			2	1
2						1	1				1	1	1	1					3	1		1	1
9.0					1						1	2	1							2			
8					2		3					1	1						1			2	
6							2					2							1				
4					2	1	1				3	4	1	1					2	2		3	
2						1						1	1							1		1	
8.0											2	1	1					2	1	2			
8					1	2					3	3	1						1			1	
6					3	3	2				4	1							2	1			
4					3	1					5		2					1	1	1			
2					2	2	1				2	1											
7.0					1	2	2				5	1							3	1			
8					1	2							1	1					1				
6				1	2	4	1			2	3	3											
4				1	3	1				1	1							1	3				
2				2	1		1			3	1							2	4				
6.0				3	2	3	1			3	1							2					
8			1	4	3	1				4	2	1					1	6					
6			1	7	2	1			1	8	1						1	3					
4				4	2	1			2	3	1						1	5	2				
2		1		6					1	8	3						5	3					
5.0			1	3	1				3	4								1					
8			4	6					8	5							1						
6		1	5	2					4	3							3	2					
4		1	3	2		1			6	4							6	2					
2		3	7						5	1						1	2						
4.0		2	3	1				1	1	1							1	3					
8		2	2	1				3	3							3	1						
6		1	2	1				2	5							1	5						
4	1	3	5					2	4								1						
2		8	1					4	2							2	4						
3.0	7	11	3					8	3							5	1						
8	6	4	1					1	3							4	1						
6	4	7						2	1							4							
4	15	3						4								2							
2	5																						
2.0																							
Grade	2	3	4	5	6	7	8	2	3	4	5	6	7	8	2	3	4	5	6	7	8		
N	38	47	48	44	33	28	22	39	50	50	41	36	29	20	22	34	34	33	29	20	8		
Median	2.5	3.2	4.4	5.4	6.9	7.1	8.7	3.0	4.4	5.4	7.4	8.8	10.0	10.0+	3.04	4.4	5.7	7.9	10.0+	9.6	10.0+		
Groups	A							G-1							G-2								

Data for the school as a whole, from year to year, show that grade scores in reading at each grade level are higher than in arithmetic and spelling, especially at grade four and beyond. The difference in acceleration for all groups in the three subjects can be accounted for partly in terms of the subjects themselves, the different psychological processes involved in learning to read or spell as contrasted with learning arithmetic; and also in the way in which and time at which elementary instruction in these skills is given at the school. There is a tendency to begin systematic instruction earlier in reading than in spelling or arithmetic. Furthermore, the transfer effect from reading to spelling is naturally somewhat greater in the early years than spread of training from reading to arithmetic.

The child who is well started in reading techniques by the end of the second or third grade can make progress quite independently from that point

TABLE 3

DISTRIBUTION OF STANFORD ACHIEVEMENT TEST SPELLING SCORES

Grade Score																							
10.0+							3					2	12	12					1	7	9	5
10.0						1	2						1									
8						1						2	1									
6						1						4								1	1	
4												1	1	1						1	1	1
2				1		2	3					2	1						1		3	
9.0						2					2	1	1						2	1		
8					1							1	2						1	2		
6						1	1				2		1						1	1		
4					3		4				1	3	1	1					1	5		1
2						1	1				1	1	2							4	2	
8.0						4					1		1	2				1	2	2	1	
8						2					3	2	1	1					1	1		
6			1		1	3	1			3	1	1					2	3	3	3		
4					2	2				1	2	5	1					3				
2							1				3	1						4	2			1
7.0				1	1		3			3	3	3	2					2	3			
8				2	4	1	1		1	1	1							2	2		1	
6				1	3	2			1	3	4	6						1				
4					1				1	2	4	1						3				
2				5	4	1	1			2								3	3	1	1	
6.0				3	2	1			1	1	2	1					6			1		
8			1	2	1				1	1	1								1			
6			3	1	3	1			1	4	2	1						5	1			
4		1		4	1	1		1	6	6	2					2	2	2	1			
2			3	4	1				2	3	1					2						
5.0		1	5	4	2				1	4					1	1			1	1		
8	1	1	3	5		1			3	4	1				3	4	2	2	1			
6		1	8	6				1	8	2	2				1	3	2	1				
4		2	4	1						3						2						
2		2	1					1	1	2					2	1						
4.0	1	3	1	2	1				3		1				2	3	3					
8		2	3	1				2	4						2	3						
6	1	5	7	1	1			2	4	1					1							
4	2	2	3					3	2	2							1					
2	1	9	3	1				7	5							1						
3.0	3	4	1					8	2	1					2	2						
8	5	8						6	2						3	1						
6	6	4						1	1	1					2	1						
4	18	2						7							3							
2																						
2.0																						
Grade	2	3	4	5	6	7	8	2	3	4	5	6	7	8	2	3	4	5	6	7	8	
N	38	47	47	45	32	28	21	39	50	50	40	38	28	17	22	34	34	32	29	19	8	
Median	2.6	3.1	4.6	5.3	6.4	7.9	8.5	3.1	4.6	5.5	6.8	7.8	9.7	10.0+	3.8	4.8	6.3	7.4	8.5	9.7	10.0+	
Groups	A							G-1							G-2							

on provided that he is normally stimulated to read by his experiences and has readily available an adequate and appropriate supply of reading material. In spelling and arithmetic, however, somewhat more direct teaching and carefully supervised exposure to new words and algorisms is necessary in order to keep the learning curve steadily accelerating during the elementary school years. The child is less apt to continue learning to spell increasingly difficult words on his own initiative, because the process is a mechanical one, has no content, and therefore lacks meaning in itself. In arithmetic, even more than in spelling, the newer, more intricate and complex processes can only be gained by

TABLE 4

DISTRIBUTIONS OF CHRONOLOGICAL AGE AND STANFORD BINET INTELLIGENCE QUOTIENTS

Chronological Age								
10-0								
10	1			IQ		IQ		IQ	
8	1								
6	3			110		139	3	161	2
4	3	2		109	1	138	5	160	1
2	12		1	108	7	137	6	159	1
9-0	6	4	3	107	4	136	2	158	
10	5	4		106	5	135	3	157	
8	8	5	2	105	2	134	5	156	3
6	1	7	7	104	5	133	5	155	2
4	2	8	5	103	6	132	9	154	2
2	6	5	7	102	3	131	2	153	1
8-0	2	5	4	101	2	130	11	152	
10		6	3	100	5			151	
8		4	2	99				150	1
6		1	1	98	2			149	1
4			1	97	3			148	1
2				96	1			147	2
7-0				95	1			146	3
10				94	3			145	2
8				93				144	2
6				92				143	1
4				91				142	3
2				90				141	4
6-0								140	4
N	50	51	36	N	50		51		36
Median	9-0	8-5	8-4	Median	103.8		133.7		146.7
Groups	A	G-1	G-2		A		G-1		G-2

most children through direct instruction. The amount of instruction necessarily varies with the age and ability of the child, but few children acquire through their own unguided efforts sufficient skill in arithmetic to keep the learning curve smoothly and positively accelerated during the elementary school years. This holds true more particularly of computation than of written problems involving fairly simple computation, since reasoning of this sort is akin to the reading process itself.

Children in these three groups were not segregated for classroom instruction but worked together under substantially the same conditions at all times. These records afford an excellent opportunity to observe the differentiation in learning which takes place in spite of fairly uniform instruction for all the children regardless of ability. The rapid acceleration shown by the brighter children took place without any special school provisions for their needs as contrasted with the slower children. There was no differentiation in content work, opportunity to use the library, and other conditions except as the children themselves imposed them. As differences appeared, small groups of the less capable children within the larger heterogeneous class were given work in skills more suited to their needs than that provided for the faster learners. Almost invariably as the upper grades were reached the children in Group A were found to be in need of "remedial work" or special individualized help for a longer or shorter period of time. This help was given by classroom teachers, teaching assistants, or by specially employed tutors. Sometimes one of these slower learning children received help in all three skills; in most cases in not more than one or two. More children received help in reading than in the other subjects. Children in the gifted groups received no such help, at least

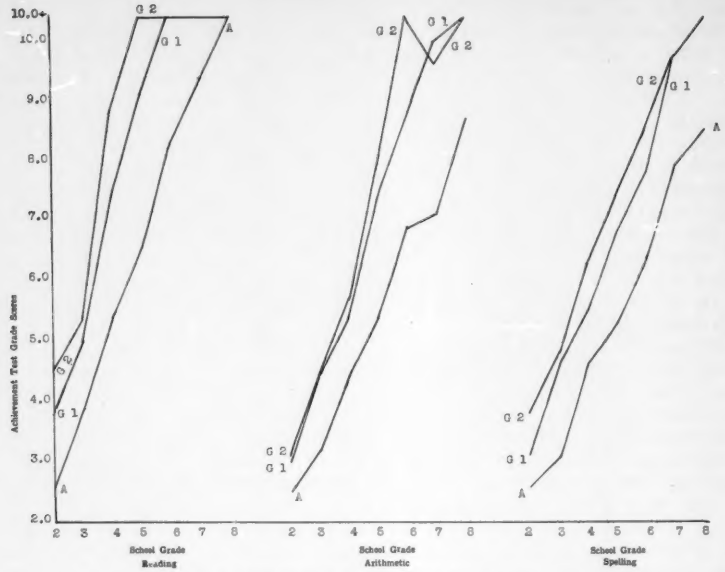

Figure 1. Stanford Achievement Test Median Curves for Three Ability Groups

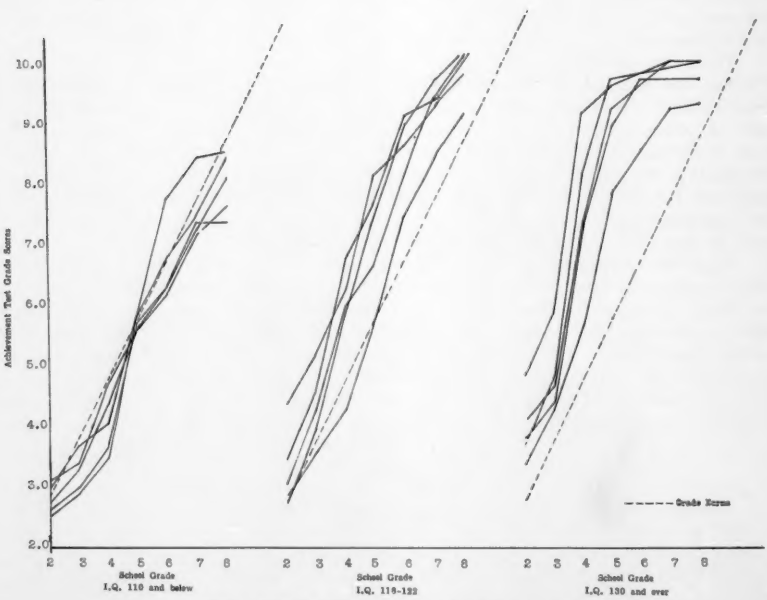

Figure 2. Individual Stanford Achievement Growth Curves at Three I.Q. Levels

on the part of the school.

That achievement in academic school work through the elementary grades is in itself a test of intelligence when learning conditions are similar for a given population has been recognized since long before the advent of intelligence tests. Learning to read and the matured process of reading requires constant exercise of reasoning and judgment. To guess correctly and infer quickly from content what meaning shall logically follow is the chief essential in rapid and accurate reading. Learning to spell taxes the memory, requires skill in making perceptual discriminations and in forming associations. The mental gymnastics required to hurdle fractions, the difficulties in learning long division or even the multiplication tables have been recognized ever since the first discouraged school child "failed" in arithmetic. When environmental conditions for learning are fairly uniform as they were in the case of the present study, it may be assumed that the differences found may in part be attributed to the child's individual ability to learn and to profit from instruction.

Within the separate groups themselves wide individual differences in learning are found. There is marked overlapping between the distributions of scores in the separate subjects in the two gifted groups; there is also considerable overlapping in the gifted and average groups. These overlappings in part are attributable to variations in chronological age and mental ability among the individuals within any one group. In these groups as in most school classes this variation is found to be two years or more. Furthermore, personality and behavior characteristics, individual social and emotional traits affect learning as all teachers know. This is particularly true of children during the initial stages in learning to master any skill; the child's subsequent progress is also affected by his initial success in achievement. In view of these facts, we cannot expect the correlation between potential scholastic aptitude and eventual achievement to be perfect. In view of the many factors that influence and at times distort the learning curve, the general consistency in the trends observed in this study are all the more significant.

These median curves for the three groups suggest the futility of trying to bring the comparatively slower learner up to the level of more gifted children through special remedial drill. The time thus spent in many schools could be spent in more profitable ways so far as the pupils are concerned. Instead of disregarding or discrediting data that reveal differences in learning potentiality, educators should welcome the saving in time and energy that consideration for these facts in educational programs generally would entail. The data summarized in this study suggest the need and economy of individualizing work in the skill subjects within classroom groups.

That the slower learners tend not to survive in the school as well as the gifted children is shown by the numbers of cases available for study. In the two gifted groups combined there were 86 cases with a succession of three or more annual Stanford tests; and there were 51 such cases in the slower group. Yet the pupil intake in the school during the period covered by these data is in the ratio of approximately 50:50 for the two groups. If anything, the Stanford data summarized here represent a natural selection among the slower learners - those cases that do not drop out as soon as difficulties in learning appear.

HOUR OF BIRTH AND STILLBIRTH AND NEONATAL MORTALITY RATES

J. YERUSHALMY[1]

It is well known that births do not occur uniformly throughout the day. There are, proportionately, more births between midnight and noon than between noon and midnight. DePorte (1) showed that the distribution of stillbirths in 1929 in New York State, exclusive of New York City, was, in general, opposite to that of live births, and that the stillbirth rate per 1000 total births varied considerably with the hour of birth. Infants born in the afternoon were exposed to a greater risk of being born dead than those born in the morning. The highest stillbirth rate was found for infants born between 3 and 6 P.M. Comments by several leading obstetricians on these reported findings are included in DePorte's paper. These comments suggest two possible explanations: (a) that "during the afternoon there are a larger number of cases which are delivered after a long labor, as labor usually begins during the previous night or early morning," and (b) that "during the later afternoon hours there may be more operative interference and a greater use of pituitrin because of the fact that most physicians are particularly busy at this time, either at their offices or in making rounds of their different patients. In the early morning hours, on the other hand, they are perhaps slower to terminate any given case owing to the courage it takes to get out of bed at such time." One observer[2] suggested that "if it is possible to do so, you check the incidence of operative deliveries during the different time periods which you have analyzed. You might find that the incidence of operative deliveries would be higher at certain times of day than during the other periods."

It is appreciated that neither of these suggestions can be tested fully with the material available in a health department. It is also realized that even if the incidence of operative deliveries by hour of birth follows the same pattern as the stillbirth rate it does not follow that there is a causal relationship between them. It was thought worth while, nevertheless, to study the stillbirth rate by hour of birth in New York State, exclusive of New York City, for the births of another year (1936), and to add the same information for neonatal mortality (death of infants under one month of age) and for incidence of operative deliveries.

Table 1 shows the percentage distribution of live births by hour of birth in three-hour periods for New York State, exclusive of New York City, for the years 1929 (DePorte's figures) and for 1936, and in addition figures from a table given by Bradford Hill (2). This last table does not specify the place and year of birth, but it presumably refers to some unspecified locality in England.

It may be observed that the variations in the percentages by hour of birth are very similar in the three columns. The births in each case were more numerous between the hours of midnight and noon than between noon and midnight. The respective percentages for the morning births were 55.0 in 1929, 54.1 in 1936, and 54.4 for Bradford Hill's figures.

The distribution of the stillbirths by hour of birth in the same places is shown in Table 2.

[1]From Division of Maternity, Infancy, and Child Hygiene, New York State Department of Health. The author wishes to express his appreciation to Dr. Archibald S. Dean, District State Health Director for the Buffalo District, and to Mr. Thomas J. Duffield, Registrar of Records for the New York City Department of Health, for furnishing the tables on operative procedure by hour of birth.

[2]Dr. Fred L. Adair, University of Chicago.

TABLE 1

DISTRIBUTION OF LIVE BIRTHS BY HOUR OF BIRTH, NEW YORK STATE, EXCLUSIVE OF NEW YORK CITY, 1929 AND 1936, AND FIGURES FROM BRADFORD HILL

Hour of Birth	Number of Births			Per Cent		
	1929	1936	Figures from Bradford Hill	1929	1936	Figures from Bradford Hill
Total	92,662	82,077	32,224	100.0	100.0	100.0
12 to 2 A.M.	11,990	10,706	4,064	12.9	13.0	12.6
3 to 5 "	13,289	11,360	4,627	14.3	13.8	14.4
6 to 8 "	12,699	10,933	4,488	13.7	13.3	13.9
9 to 11 "	13,011	11,379	4,351	14.0	13.9	13.5
12 to 2 P.M.	9,604	9,010	3,262	10.4	11.0	10.1
3 to 5 "	10,232	9,496	3,630	11.0	11.6	11.3
6 to 8 "	9,910	8,965	3,577	10.7	10.9	11.1
9 to 11 "	11,927	10,228	4,225	12.9	12.5	13.1

TABLE 2

DISTRIBUTION OF STILLBIRTHS BY HOUR OF BIRTH, NEW YORK STATE, EXCLUSIVE OF NEW YORK CITY, 1929 AND 1936, AND FIGURES GIVEN BY BRADFORD HILL

Hour of Birth	Number of Stillbirths			Per Cent		
	1929	1936	Figures from Bradford Hill	1929	1936	Figures from Bradford Hill
Total	3,345	2,288	1,272	100.0	100.0	100.0
12 - 2 A.M.	409	300	126	12.2	13.1	9.9
3 - 5 "	415	261	157	12.4	11.4	12.3
6 - 8 "	370	283	142	11.1	12.4	11.2
9 - 11 "	442	304	195	13.2	13.3	15.3
12 - 2 P.M.	366	263	150	10.9	11.5	11.8
3 - 5 "	474	317	178	14.2	13.9	14.0
6 - 8 "	418	270	144	12.5	11.8	11.3
9 - 11 "	451	290	180	13.5	12.7	14.2

The distribution of stillbirths was quite distinct from that of live births for each set of data. Whereas the live births were generally more numerous in the morning, there were somewhat more stillbirths in the afternoon. The respective percentages for the morning stillbirths were 48.9 in 1929, 50.2 in 1936, and 48.7 for Bradford Hill's figures.

Tables 1 and 2 are combined in Table 3 to give the stillbirth rates per 1000 total births by hour of birth.

The general trend is the same in all three cases. The stillbirth rate was considerably higher in the afternoon than in the morning. The respective rates for the births between midnight and noon were 31.1 in 1929, 25.2 in 1936, and 34.2 for Bradford Hill's figures. The corresponding rates for the births between noon and midnight were 39.4, 29.4, and 42.5. The corresponding percentage increases in the stillbirth rates for the afternoon over the morning births were 27, 17, and 24. The highest stillbirth rate for each set of data was recorded for the infants born between 3 and 6 P.M.

For purposes of another study (3), the birth certificates for all the neonatal deaths in 1936 in New York State, exclusive of New York City, were located. It was therefore possible to tabulate these deaths by hour of birth. The neonatal mortality rate by hour of birth followed on the whole the same trend as the stillbirth rate. Also in this case the mortality rate in the afternoon hours was considerably above that in the morning hours and the neonatal mortality rate was highest also between 3 and 6 P.M. Since there are undoubtedly some stillbirths which should have been registered as neonatal deaths

TABLE 3

STILLBIRTH RATES PER 1000 TOTAL BIRTHS BY HOUR OF BIRTH, NEW YORK STATE, EXCLUSIVE OF NEW YORK CITY, 1929 AND 1936, AND FIGURES FROM BRADFORD HILL

Hour of Birth	Stillbirth Rates*		
	1929	1936	Figures from Bradford Hill
Total	34.8	27.1	38.0
12 - 2 A.M.	33.0	27.3	30.1
3 - 5 "	30.3	22.5	32.8
6 - 8 "	28.3	25.2	30.7
9 - 11 "	32.9	26.0	42.9
12 - 2 P.M.	36.7	28.4	44.0
3 - 5 "	44.3	32.3	46.7
6 - 8 "	40.5	29.2	38.7
9 - 11 "	36.4	27.6	40.9

*Per 1000 total births (including stillbirths)

and conversely some neonatal deaths which are actually stillbirths, it is probably best to inspect the combined loss, i.e., the number of stillbirths and neonatal deaths per 1000 total births. The neonatal mortality rates and the rates for combined loss by hour of birth are presented in Table 4.

TABLE 4

NEONATAL MORTALITY AND COMBINED LOSS (LATE FETAL AND NEONATAL MORTALITY) BY HOUR OF BIRTH. NEW YORK STATE, EXCLUSIVE OF NEW YORK CITY, 1936

Hour of Birth	Numbers		Rates	
	Neonatal Deaths	Combined Loss	Neonatal* Mortality	Combined** Loss
12 - 2 A.M.	293	593	27.4	53.9
3 - 5 "	309	570	27.2	49.0
6 - 8 "	298	581	27.3	51.8
9 - 11 "	385	689	33.8	59.0
12 - 2 P.M.	269	532	29.9	57.4
3 - 5 "	351	668	37.0	68.1
6 - 8 "	295	565	32.9	61.2
9 - 11 "	358	648	35.0	61.6

*Neonatal Mortality rates per 1,000 live births.
**Rates for combined loss per 1,000 total births (including stillbirths)

OPERATIVE PROCEDURE

The birth certificate in use in New York State outside of New York City does not contain information relative to operative procedure. However, a special certificate for Buffalo City containing such information has been in use for the last two years. Dr. Archibald S. Dean, District State Health Director in charge of the Buffalo District, was kind enough to tabulate the 1937 births by type of delivery and hour of birth. Table 5 was obtained.

A comparison of the column of percentage operative deliveries with the table of stillbirth and neonatal mortality rates by hour of birth (Tables 3 and 4) reveals that the two followed similar trends. The proportion of the deliveries that were operative was considerably higher in the afternoon than

TABLE 5

DISTRIBUTION OF BIRTH BY TYPE OF DELIVERY AND HOUR OF BIRTH, BUFFALO, N.Y., 1937

Hour of Birth	Number of deliveries										Per Cent Operative	Per Cent Forceps-(Low, Mid, and High)
	Total	Normal Spontan.	Low Forceps	Mid Forceps	High Forceps	Version	Cesarean Sec.	Breach	Other Operative	Not Stated		
Total	9,918	6,137	2,089	279	57	574	258	266	88	170	37.0	24.9
12 - 2 A.M.	1,260	809	260	37	10	60	20	33	7	24	34.5	24.8
3 - 5 "	1,280	895	231	27	4	57	9	23	11	23	28.8	20.8
6 - 8 "	1,333	896	262	23	4	60	10	42	9	27	31.4	22.1
9 - 11 "	1,364	748	312	49	9	111	61	41	8	25	44.1	27.6
12 - 2 P.M.	1,171	690	256	42	11	62	45	31	17	17	40.2	26.8
3 - 5 "	1,201	673	268	41	11	88	68	23	14	15	43.3	27.0
6 - 8 "	1,109	696	245	35	4	48	17	32	7	25	35.8	26.2
9 - 11 "	1,200	730	255	25	4	88	28	41	15	14	38.4	23.9

in the morning hours. The peak occurred in this case between 9 and 12 in the morning, but is was only slightly higher than the next highest which occurred between 3 and 6 P.M. The fact that between 9 and 12 A.M. the number of operative deliveries is so high may perhaps be explained by the fact that these are the hours in which most operations are carried out in the hospital. In this connection the relative high numbers of Cesarean sections and version deliveries performed during these morning hours may be noted.

The last column presents the percentage of forceps deliveries only (low, mid, and high) by hour of birth. The pattern is the same as for total operative, and very much like that of the stillbirth and neonatal mortality rates. An inspection of the columns by various types of forceps shows that the greatest variation is presented by mid forceps.

Although these variations are beyond the range that would be expected on the basis of chance alone, it was thought desirable to present a similar table for another locality. This was made possible through the cooperation of Thomas J. Duffield, Registrar of Records of the New York City Department of Health, who was kind enough to tabulate a random sample of some 5000 birth certificates of New York City which contain the information relative to operative procedure. This is presented in Table 6.

TABLE 6

DISTRIBUTION OF BIRTHS BY OPERATIVE PROCEDURE AND BY HOUR OF BIRTH -- 5291 BIRTHS IN NEW YORK CITY, 1937

Hour of Birth	Number of Births						Per Cent Operative Delivered	Per Cent Forceps or Version
	Total	Normal Spont.	Forceps or Version	Cesarean Sec.	Other Operative	Not Stated		
Total	5,291	3,706	1,132	177	27	249	26.5	22.5
12 - 2 A.M.	650	474	133	9	3	31	23.4	21.5
3 - 5 "	730	570	116	9	2	33	18.2	16.6
6 - 8 "	717	544	128	19	1	25	21.4	18.5
9 - 11 "	722	481	141	61	3	36	29.9	20.5
12 - 2 P.M.	597	399	138	23	6	31	29.5	24.4
3 - 5 "	648	419	173	20	7	29	32.3	27.9
6 - 8 "	648	439	159	18	1	31	28.8	25.8
9 - 11 "	579	380	144	18	4	33	30.4	26.4

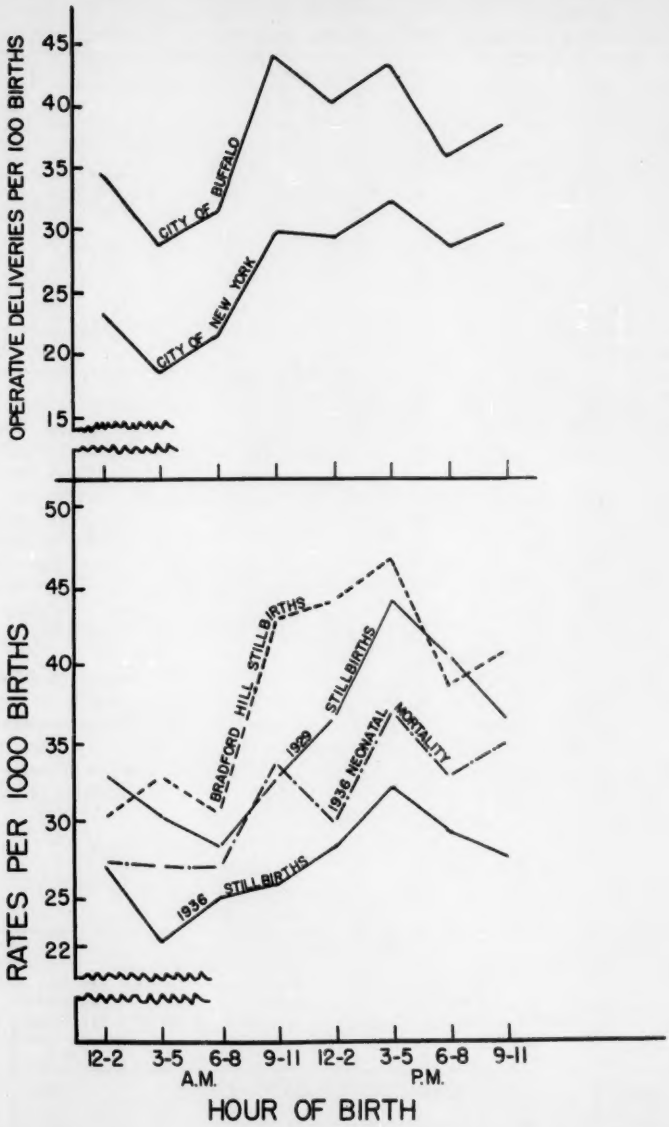

Figure 1. Stillbirth and neonatal mortality rates for New York State, exclusive of New York City, in 1929 and 1936, and stillbirth rates obtained from figures given by Bradford Hill, as well as percentages of operative deliveries for Buffalo and New York City in 1937 by hour of birth.

On the New York City certificate the forceps deliveries were not separated as to kind of forceps. Furthermore, there was no separation of forceps and version, and hence the two are considered together.

Although the percentage of the deliveries that were operative was considerably lower in New York City than in Buffalo, the distribution of the percentages of operative deliveries by hour of birth was very similar in the two cities. The peak in New York City was between 3 and 6 P.M., and the pattern was very similar to the neonatal and stillbirth rates.

For comparison, the rates for stillbirth and neonatal mortality in 1929 and 1936 and those for Bradford Hill's figures, as well as the distribution of the percentages of operative deliveries in Buffalo and New York City by hour of birth, are presented in Figure 1.

SUMMARY

Stillbirths and neonatal mortality rates by hour of birth are presented. The rates were considerably higher for infants born between noon and midnight than for infants born between midnight and noon. The highest rate was found for infants born between 3 and 6 P.M. The percentage of deliveries which were operative was found to follow the same trend. However, it is realized that this correlation does not necessarily imply causal relationship.

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GROWTH IN SOUTH AFRICAN WHITE BOYS IN INSTITUTIONS: A STUDY OF FIVE DIMENSIONS IN 446 CASES[1]

HARDING le RICHE[2]

In another paper (6) a comparison was made of growth in European and Eurafrican boys in the Tokai Reformatory. It was found that the Europeans exceeded the Eurafricans in nearly all dimensions. This paper should be consulted for further details. As has been mentioned in this previous paper, the physical measurements of the European boys were taken at the suggestion of Dr. L. Fick, Psychologist, National Bureau for Educational and Social Research, and Dr. Felix Brümmer, Technical Advisor, Department of Social Welfare, who are making a study of boys in certain institutions under control of the Union Education Department, from the sociological and psychological points of view. The measurements were taken on 446 boys, aged eleven to twenty-three years, at the Houtpoort Reformatory, Heidelberg, (Tvl), the Emmasdale Industrial School, also at Heidelberg, and at the Tokai Reformatory, Cape Town. The technique of measurement was unfortunately not quite the same for Emmasdale and Houtpoort on the one hand, and Tokai on the other hand. The technique used at Tokai has already been described, (6), and follows the technique of the Iowa Child Welfare Research Station, (7), as closely as practicable. At the other two institutions the boys were weighed clad in a thin pair of short khaki trousers, all heavy objects having been removed from belts and pockets in order to obtain uniformity in the weight of clothing (4). The trousers worn were all of the same type and did not weigh more than 500 g. In the absence of accurate information on the weight of a fairly large number of trousers, a correction has not been made for weight of clothing, the means, standard deviations etc. of the weights in the various age groups in the three institutions being calculated from the weights as they appeared on the questionnaire blanks. As at Tokai, all body measurements were taken on the skin, but as flat callipers accurate to 1 mm. were not available for the Houtpoort and Emmasdale observations, a pair of curved callipers, (pelvimeter) accurate to 5 mm. had to be used, an attempt being made to take the measurements in the positions suggested by the Iowa Research Station. The measurement taken with the pelvimeter was the bi-iliac width, the greatest diameter between lateral lips of the iliac crests, pressure being applied in order to get a bone measurement, as nearly as possible. The technique for the height, sitting height and chest circumference (xiphoid level) were the same for all the boys and is described more fully in the paper already mentioned.

With reference to the racial composition of these boys by far the greater majority of them are of North-West European origin. One would not consider 95 per cent as too high an estimate. Also, in most cases, the parents of these boys were born in this country. It is regretted that detailed accurate information on these questions is not at present available. Another point on which there is unfortunately no information is the extent to which there is an admixture of coloured strains. A few cases were seen who without any doubt had a colored individual (i.e. Cape Coloured, or much more rarely perhaps, Bantu) somewhere in their family tree. But the number of these cases is very small, about 1 per cent. One hopes that the day is not far

[1]Read at meeting of the South African Association for the Advancement of Science held at Pietermaritzburg, Natal, during July 1938.

[2]From Union Health Department, Pretoria, Union of South Africa. Grateful acknowledgment is made to the S. A. Council for Educational and Social Research for the grant which made this work possible, and to the authorities of the Union Education Department for their kindness in allowing the author to examine the boys at their Institutions.

off when someone will make a thorough study of the racial composition of the Europeans in South Africa.

One must realize that the cases discussed, are, in the main, drawn from the lower strata of society. This will be brought out much more fully in the sociological and psychological investigations at present being carried out on these same boys. The majority of boys have either been in orphanages most of their lives, or have been deserted by their parents or have been removed from unwholesome environment by the State. One regrets to say that at present quite a number of the Industrial School boys graduate to enter the Reformatories and afterwards the Prisons (3).

The data with which this material is compared have been obtained for American boys from the Iowa Child Welfare Research Station, (8). The German figures are from figures obtained by the Leipzig Health Department (5). An attempt has been made to obtain the latest figures, as evidence from all over the world (Sanders 1930, Koch 1935, Brock 1932) shows that children have been increasing in size; hence the inapplicability of old observations. Growth standards are not static - the human frame is changing, not very much, but the increase in size is very evident to the student of human growth. The American boys are from a rather favoured group. To quote Meredith, "Most apparent is the predominance of the professional class and the insignificant representation of the labouring class. On the basis of the whole table, it seems reasonable to deduct that the data were gathered on a well-nourished group of males.

"In summary, the group on whom the data were taken may be characterized as homogeneous with reference to geographic location and sex, not significantly diverse racially, and somewhat favoured economically and culturally." The German figures are from High School boys, i.e. also from a relatively favoured class. One has purposely selected these standards: the days of minimum growth and nutrition standards are past. We must create an environment in which the children will attain the highest standards of physical well-being possible under their hereditary constitution. The standards mentioned are far from being the optimum. Only the future will show what a favourable milieu can bring about. The German figures are available only for height and weight. Details of somatometric technique are not given. It is assumed that height was measured according to the usual custom, i.e. subject without shoes and stockings, standing against the wall with head in the Frankfort plane. Weights were probably not taken in the nude.

Meredith's technique for taking standing heights is the usual technique, i.e. subject standing with head, heels, buttocks and upper part of back against measuring scale. Head in Frankfort plane, square being brought down firmly on head of subject, whose shoes and stockings have been removed. In taking sitting height the subject sits on a bench 30 or 40 cm. high, thoracic and sacral regions against vertical standard, head in Frankfort plane. Weight was taken on nude subject in kilograms. For further details the original publication (8) should be consulted.

THE MEASUREMENTS

1. Weight.

The weights of the boys are given in Table 1, and on Chart 1 the curves are shown for American and German boys. The age groupings for the American boys are in one-year classes, i.e. 13 years 6 months to 14 years 5 months and 30 days. That is, the midpoint of the interval is 13 years. In my grouping the midpoint of the groups falls on the half-year as the groupings are, e.g. 14 not yet 14, 14 not yet 15 years, etc. for the institution

CHART 1

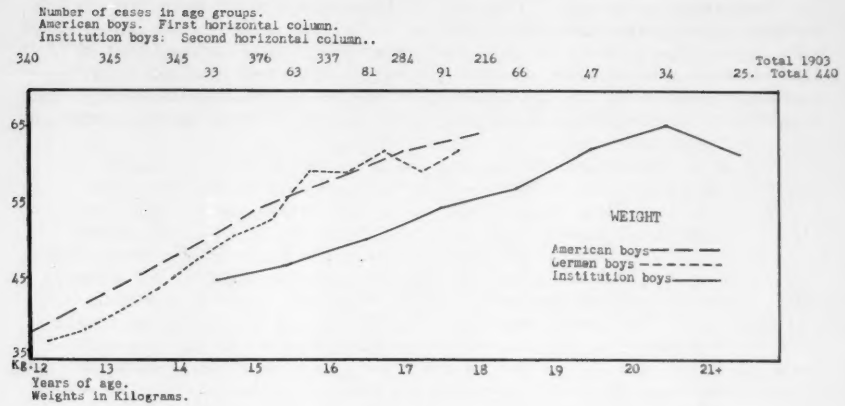


TABLE 1

WEIGHT IN KILOGRAMS

Age Groups	12-	13-	14-	15-	16-	17-	18-	19-	20-	21
Number of cases	1	5	33	63	81	91	66	47	34	25
Mean	44.4	40.8	45.4	47.5	50.7	55.0	57.3	62.8	65.6	62.0
Median			44.79	46.25	51.12	54.95	57.50	63.21	66.38	61.50
S.D.			7.73	8.94	9.33	8.36	8.97	7.75	4.48	5.37
Coeff. of var.			17.02	19.81	18.41	15.21	15.66	12.34	6.83	8.7
S.E.			1.34	1.13	1.04	.88	1.10	1.13	.77	1.07
Range*			27.5-63.5	30.5-66.5	33.5-75.5	30.5-72.5	33.5-78.5	39.5-75.5	54.5-72.5	51.5-72.5

*Minimum and maximum values refer to midpoints of highest and lowest class intervals.

boys. The German High School boys are grouped in six-monthly classes, i.e. 13 years to 13-1/2 years, 13-1/2 years to 14 years, etc. The midpoints of these groupings fall therefore at 13-1/4 and 13-3/4 years respectively.

As will be noticed from Chart 1, the American and German boys exceed the institution boys at all ages. The German data are rather irregular in the age groups 15 to 16 and 16 to 17. One would ascribe this phenomenon to the smallness of the number of cases. Unfortunately Koch (5) does not say on how many cases his figures are based.

With the exception of the age groups already mentioned, the American boys exceed the Germans in weight. As the number of cases is fairly large in the institution material, the weight growth curve is fairly regular. It will be noticed from Table 1 that the coefficient of variation is fairly large from ages 14 to 16, falling as the boys get older. This has also been found by Meredith (8), for Iowa boys. It is clear that during adolescence there is far greater variation in weight than for instance in skeletal dimensions. (See Tables 2, 3, 4 and 5 and 6). This is as one would expect; as weight

represents the sum total of increase in bulk this value would soonest be effected by changes in the external or internal environment of the organism. The relatively stable skeletal structure would be more resistant to environmental fluctuations. One cannot legitimately conclude from the coefficients of weight variation that the younger boys are in a worse physical condition than the older boys; the weight fluctuations in adolescent boys are probably to a great extent physiologically normal, as sexual maturity is not reached by all the boys at the same ages, and weight changes, due primarily to normal endocrine activity, are spread right through the period of adolescence. As one cannot evaluate the effect of the internal environment on the boys, it is impossible, from the evidence represented above, to state with any degree of certainty whether the boys are, for instance, malnourished or not. Robertson (quoted by Roberts (10)) from a study on California school children, concluded that a defect in stature and weight, with a high variability in stature and a low variability in weight indicated the operation of an unfavourable environment, and that as a criterion of normality, then, variability in stature is a better indicator than variability in weight.

In Table 2 the variabilities of the institution and American boys are shown, for weight and height. It will be noticed that the age groups are not quite comparable as the midpoint of the group in the American data falls on the year, while the institution grouping falls on the half year.

TABLE 2

Midpoint of age groups	Height Coeff. of V.		Weight Coeff. of V.	
	American Boys	Institution Boys	American Boys	Institution Boys
14	8.53		20.4	
14½		5.75		17.02
15	8.63		19.3	
15½		5.86		19.81
16	7.58		16.3	
16½		5.04		18.41
17	6.39		14.9	
17½		4.42		15.21
18	6.25		14.1	
18½		4.75		15.66
19½		4.06		12.34
20½		3.49		6.83
21		4.32		8.7

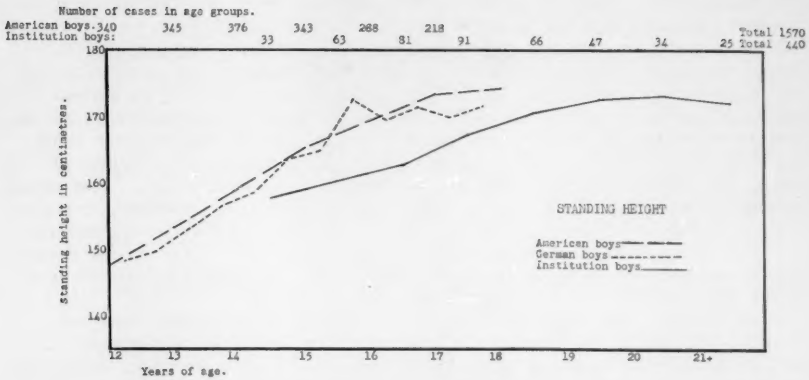
As will be seen from Table 2, the variability of the institution boys for stature is less than that of the American boys, while the coefficient of variation of the weight of the institution boys is slightly more than that of the American boys at 16-1/2 and 17-1/2 years of age respectively.

Assuming the validity of Robertson's criterion, then, the institution boys do not show more signs of the operation of an unfavourable environment than do the American boys, who are from a relatively gently nurtured group.

2. Standing Height.

The information under this heading is summarized in Table 3 and Chart 2. As in the case of weight, the institution boys are inferior to both the American and the German boys, the Americans being superior to the Germans at all ages except in the group 15-16, where the German boys are taller. The curve for the German boys is irregular, probably due to smallness of numbers. The age groupings are the same as mentioned above. Koch (5) in an examination of Leipzig data on school children observes that there has been an

CHART 2



increase in both height and weight in comparable children during twenty years. This phenomenon has been noticed by many workers all over the world, as has already been pointed out in this paper. He then goes on to say that the boys measured during 1932/33 reach their adult stature 1-1/2 years sooner than was the case in similar boys in 1922. One does not question that the boys are taller for their ages than was previously the case, but the evidence in support of the quicker attainment of mature height does not seem conclusive. For one, the number of cases does not seem large enough as the writer himself states: "Die leichte Unruhe der Kurve der höheren Schüler in ihren letzten Halbjahrängen erklärt sich aus der Tatsache, dass naturgemass in diesem Alter nur noch ein relativ geringes Zahlenmaterial zur Verfügung steht. Wenn mithin auch der Einzelwert hierunsicher erscheint, so kann doch an der Tendenz des Verlaufes der Kurve keinerlei Zweifel sein" (P.14).

As it is clear from Chart 2, the curve for the Leipzig boys shows a sudden rise in the age group 15-16 and then again falls. This rise points to fewness in the number of observations made. Assuming that this might be the case in the High School boys, what justification is there for assuming that it applies to the whole population in view of the fact that mentally accelerated children are usually also physically accelerated? ((1), see also (10)). Which would mean that in any case the High School boys would probably be accelerated when compared with the general population of boys. Another point which must be considered is that the High School boys are a highly selected group and not representative of the whole population. Koch's conclusions might be correct in connection with quicker attainment of mature stature, but the evidence he gives in support of his statement is not conclusive. The institution boys appear to reach their mature stature between 20 and 21 years, which is the usual age. The Tokai material (6) also seems to indicate a quicker attainment of mature stature, but utilizing all the available data for institution boys, the evidence suggests that this assumption is erroneous.

3. Sitting Height.

The data on the sitting height are shown in Table 4. In general this curve resembles that of bi-iliac width, which is shown in Chart 3. It will

be noticed that the variability of the sitting height decreases as the age increases. This is also the case for standing height. It was not considered necessary to include a curve of sitting height.

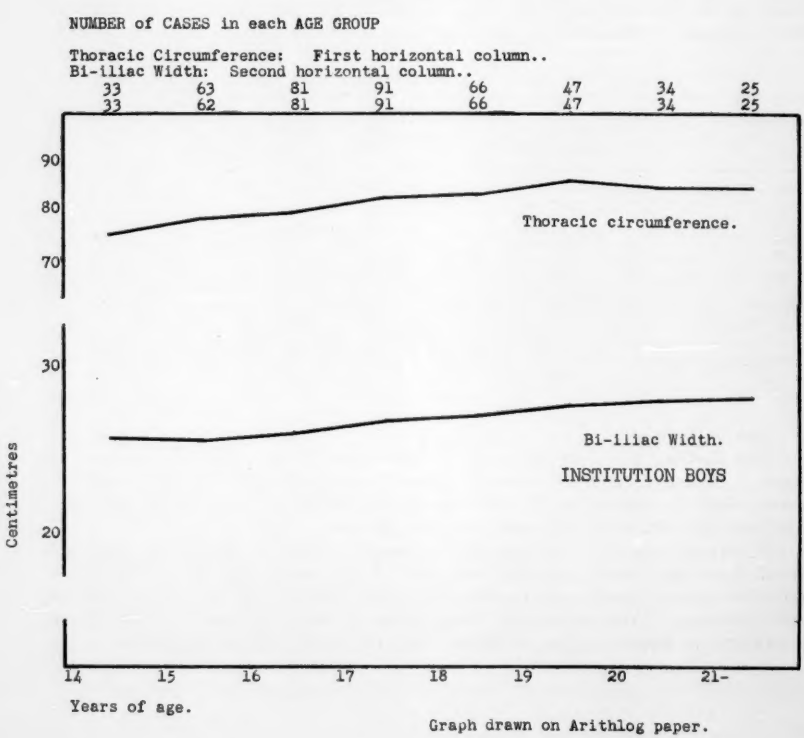
TABLE 3

STANDING HEIGHT IN CENTIMETRES

Age Groups	12-	13-	14-	15-	16-	17-	18-	19-	20-	21-
Number of cases	1	5	33	63	81	91	66	47	34	25
Mean	160	153.7	157.7	160.3	162.8	167.3	170.8	172.9	173.1	172.0
Median			158.80	161.56	164.55	168.61	168.0	173.50	168.00	173.56
S.D.			9.08	9.39	8.20	7.39	8.12	7.02	6.04	7.43
Coeff. of Var.			5.75	5.86	5.04	4.42	4.75	4.06	3.49	4.32
S.E.			1.58	1.18	.91	.77	1.00	1.02	1.04	1.49
Range*			138-178	138-182	146-178	150-182	150-186	154-186	162-186	154-186

*Minimum and maximum values refer to midpoints of highest and lowest class intervals.

CHART 3



Graph drawn on Arithlog paper.

TABLE 4

SITTING HEIGHT IN CENTIMETRES

Age Groups	12-	13-	14-	15-	16-	17-	18-	19-	20-	21*
Number of cases	1	5	33	63	80	91	64	46	34	25
Mean	77.5	76.2	80.3	81.1	82.6	85.3	85.5	88.6	89.2	89.2
Median			79.71	81.80	89.91	85.55	86.27	88.67	87.67	89.29
S.D.			5.12	5.03	4.93	3.96	4.72	3.40	3.34	3.12
Coeff. of Var.			6.38	6.20	5.97	4.65	5.52	3.84	3.74	3.50
S.E.			.91	.63	.55	.42	.59	.50	.57	.62
Range*			68.5-90.5	68.5-90.5	72.5-92.5	74.5-92.5	74.5-94.5	78.5-96.5	78.5-94.5	80.5-94.5

*Minimum and maximum values refer to midpoints of highest and lowest class intervals.

4. Normal Chest Circumference.

The chest circumference was taken at the xiphoid level and therefore not comparable with the Iowa data (8) which was taken at the nipple level.

The data are given in Table 5 and the curve is drawn on arithlog graph paper. (9, p. 184). As is shown, the thoracic circumference increases regularly up to the age of 19-1/2, when the nature size seems to be reached. The variation is irregular from age to age.

TABLE 5

NORMAL CHEST CIRCUMFERENCE (XIPHOID LEVEL) IN CM.

Age Groups	12-	13-	14-	15-	16-	17-	18-	19-	20-	21*
Number of cases	1	5	33	63	81	91	66	47	34	25
Mean	73.5	71	74.2	77.5	78.7	81.7	82.1	85.1	83.8	84.4
S.D.			4.23	5.22	5.67	4.51	5.17	4.56	2.99	4.13
Coeff. of Var.			5.56	6.74	7.20	5.53	6.30	5.35	3.57	4.89
S.E.			.74	.66	.63	.47	.64	.66	.51	.83
Range*			64.5-82.5	66.5-88.5	64.5-92.5	64.5-92.5	68.5-96.5	74.5-96.5	80.5-94.5	74.5-92.5

*Minimum and maximum values refer to midpoints of highest and lowest class intervals.

5. The Bi-iliac Width.

The bi-iliac width is presented in Table 6 and is graphically shown on Chart 3. This diameter increases regularly and does not show the slight increase which is shown by the thoracic circumference at the age of 19-1/2; unfortunately Meredith (8) does not give bi-iliac width in his study.

The main object of this paper has been to place on record the data obtained from the Institution boys, in view of the great lack of somatometric and other physiological and anatomical information on healthy South African white children. One hopes that much more of this work will be carried out on children in South Africa, whether they be white, black or yellow.

TABLE 6

BI-ILIAC WIDTH IN CENTIMETRES

Age Groups	12-	13-	14-	15-	16-	17-	18-	19-	20-	21*
Number of cases	1	5	33	62	81	91	66	47	34	25
Mean	24.5	24.5	25.3	25.1	25.8	26.5	26.9	27.5	27.9	28.0
Median			25.07	25.5	26.04	26.92	27.33	27.72	28.20	27.94
S.D.			1.74	1.73	1.68	1.77	2.09	1.60	1.96	1.41
Coeff. of Var.			6.88	6.88	6.50	6.66	7.72	5.81	7.02	5.02
S.E.			.30	.22	.19	.19	.26	.23	.34	.28
Range*			22.5-29.5	21.5-29.5	22.5-29.5	21.5-30.5	20.5-31.5	21.5-30.5	20.5-31.5	25.5-30.5

*Minimum and maximum values refer to midpoints of highest and lowest class intervals in groupings.

SUMMARY

1. Data are presented for measurements of weight, height, sitting height, thoracic circumference and bi-iliac diameter taken on 446 Institution boys aged 12 to 23 years.

2. Compared with certain American and German data these boys are inferior in weight and height.

3. The relation of weight and height to environment is briefly discussed.

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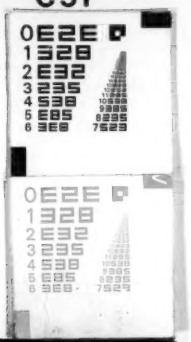
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